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1904

MASS. STATE BOARD OF HEALTH,
ENGINEER'S OFFICE.

ANNUAL REPORT

OF THE

Water Department

OF THE

CITY OF WOBURN

FOR THE YEAR 1904

The News Print, Woburn
1905

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THE NEWS PRINT, WOBURN
1905

REPORT OF COMMISSIONER OF WATER AND WATER SUPPLY FOR 1904.

WOBURN, December 31, 1904.

To the Board of Public Works, City of Woburn :

GENTLEMEN—Having just returned to the city after an extended absence, I shall not, in making my first report, the thirty-third of the department, make the attempt to give any financial summary, or general detail, leaving this to be gleaned from the reports of the Registrar and Superintendent respectively.

Within a week from the time of assuming the duties of the position, the supply of water in the well became so low as to occasion serious alarm. The pumps were unable to make a full stroke, and for days it seemed impossible that we should be able to avoid opening the gates and using the water directly from the pond. For a period during the past winter this experience was repeated, and just at present the conditions are very nearly as bad.

My immediate predecessor makes use in his last report of the phrase : "The water supply of the City of Woburn is easily its most valuable asset." I am certain that he intended this to apply to the water alone and did not comprehend any considerable portion of the plant necessary for its distribution.

First, as to the conditions at the pumping station. The Worthington pump now doing the principal part of our work is, to use the words of the engineer, "A good machine for so old a one." The Blake pump is a collected arrangement of junk only, requiring almost constant and expensive repairs in order to perform any service whatever. The service received from a pump of modern construction is so vastly superior to what can be obtained from what we now have, that, considered from the standpoint of economy alone, one should be installed at the earliest possible moment. Investigation leads to the belief that the same amount of water could be supplied with one-half the fuel used at present. We now burn approximately from ten to twelve hundred tons of coal per year, costing delivered in the city shed about five dollars per ton, or from five to six thousand dollars annually. The saving in a few years would thus constitute a sufficient sum to repay the investment. The new pump should be of a capacity sufficient to supply five or even six million gallons per day and would cost about thirty thousand dollars. The Worthington pump could be used as an auxiliary on occasion of necessary repairs. It is a matter of peculiar regret that the installation of a pump such as described, had not been made four or five years ago, as owing to advances in cost of labor and material a saving of from five to six thousand dollars might have been effected.

Second, the street mains.

The replacing of the street mains, which have now nearly all been in use for thirty years or more, is another positive necessity. The cement lined pipe has given excellent service, but we cannot expect it will be of value much longer, as the average length of service of the cast iron pipe now in general use is said to be from twenty to twenty-five years only. I believe that an appropriation of at least fifteen thousand dollars should be made annually for the renewal of our pipe service.

The numerous breaks which have occurred during the year may be attributed largely to lightning introduced to our mains through the telephone wires. The origin of the series of breaks in Mountain and New Boston streets and Mishawum road can be definitely traced to this source, and a claim will be made upon the telephone company for the amount of expense involved. I would recommend however the passage of an ordinance whereby the connections to any service pipe of any electrical appliance should be absolutely prohibited, and that any such connection now existing should be promptly removed. The cost of repairing damages incurred in this way is not the only item to be considered. The inconvenience to water takers and public travel, and the possibility of no available water in case of fire, should be taken into consideration.

Third, reservoir.

The condition of the reservoir is good, it having been thoroughly cleaned at the beginning of the past winter. The cobblestone wall which constitutes the easterly end is backed up with earth which is constantly working through the crevices between the stones and creates the vegetable taste which is sometimes a cause of complaint. I would recommend that this wall be faced with six inches of Portland cement concrete. This would prevent absolutely any waste of water through the wall as well as obviating the trouble already mentioned. I estimate the expense at twenty five hundred dollars, and as the reservoir would require cleaning much less frequently, believe it would be a good investment.

Fourth, additional water supply.

An investigation is soon to be made as to increasing our present water supply by a system of driven wells upon the westerly side of the pond. Mr. Freeman C. Coffin, who is a recognized expert authority as a cousulting engineer upon matters of water supply and who has made a careful inspection of the plant and grounds adjacent to the pond, strongly advises this as the surest and most economical method of securing the increased supply so imperatively required.

Many who have made a study of the matter are convinced that the arteries which feed the present well flow from the south. Mr. Coffin coincides in this opinion, and further believes, from the topopraphy of the land on the westerly side of the pond, that a large amount of water must come from the north following the natural valley existing. Should we be able, as we believe probable, to locate by experiment this natural feeder, the people of our city need have no anxiety as to an ample water supply for many years to come. By the installment at a slight cost, of a gasoline plant, the water could be pumped into the present well, making use of this auxiliary plant at such times only as the ordinary source of supply proved insufficient.

The department feels that while the service afforded during the past year has been a reasonably satisfactory one, it is the result of good fortune only, and that reconstruction of almost the entire system should be begun at once.

The quality of the water has been uniformly excellent, scarcely a complaint having been received.

The question of providing suitable accommodation for the pipe service department is one which should be given consideration, our present quarters being wholly inadequate. I would recommend the purchase of a sufficient amount of land and the erection of a building of such size as would enable us to locate our workshop together with stable, and also provide storage room for the various fittings, pipe, etc., which we are compelled to keep on hand. I believe this could be done for from twenty-five hundred to three thousand dollars.

While it may appear that the department is asking for a large amount of money, I feel confident that a slight investigation will establish the necessity of the demand.

The expenditures have been chiefly the ordinary ones, the principal exceptions being the installment of electric light at the pumping station, the purchase of a trench pump, and a derrick for the pipe department.

In closing I wish to say a word in regard to the employees of the department. The city is fortunate in their selection and in being able to obtain at moderate prices the services of men whom I have found exceptionally faithful and well qualified for this important service.

ELISHA F. HAYWARD,

Commissioner of Water and Water Supply.

REPORT OF THE SUPERINTENDENT OF WATERWORKS.

WOBURN, MASS., December 31, 1904.

To the Commissioner of Water and Water Supply :

SIR—I herewith submit my annual report upon the condition of the works and the operations of the department for the year ending December 31, 1904.

RESERVOIR.

The reservoir is in fair condition. It has been cleaned once during the year. The quality of the water has been of a very high standard throughout the year. The average depth during the year was 16.2 feet.

I renew my recommendations of past years that the bottom and side walls be concreted. This would necessitate the blasting out of a portion of the bottom and the cutting off of a section of the back. This improvement would facilitate the cleaning and at the same time prevent unnecessary waste which under present conditions is considerable.

PUMPING STATION AND GROUNDS.

The plant is in a good condition and has performed satisfactory service. The grounds about the station have been properly attended to during the year.

WATER SUPPLY.

I would like to call your attention to the inadequate means of supplying water to the wells. The filter gallery becomes clogged up with sediment from the water and the result is that the water supply becomes low at times.

I would recommend that immediate action be taken to remedy this defect.

CONSTRUCTION.

During the past year a 3-4 inch galv. temporary main was replaced on Mount Pleasant street with a 2 inch galv. temporary main and extended a distance of 200 feet, making the total number of feet laid during the year 437 feet.

The total number of feet laid to December 31, 1904, is two hundred and eighty-nine thousand, five hundred and one (289,501) feet, or four thousand, three hundred and eighty-one (4,381) feet over fifty-four (54) miles.

SERVICES.

The total number of new services laid during the year was twenty-five (25).

REPAIRS ON SERVICES.

Repairs of different kinds have been made on 169, divided as follows: 20 leaks, 68 cleaned, 26 renewed, 33 frozen and 22 on general repairs.

SERVICE BOXES.

There have been 43 new boxes set, 28 dug up and reset, 45 raised to conform to grade and 63 lowered.

REPAIRS ON MAINS.

The total number of breaks in mains the past year was 59. There were 43 on 4-inch, 13 on 6-inch, and 3 on 10-inch.

Of the above, 11 were caused by thin lining, 40 by lightning, 1 by rust, 3 by closing of hydrants and 4 were joint leaks.

REPAIRS ON GATES AND GATE BOXES.

Two new gates have been added to our system the past year. Repairs have been made on two which needed spindle nuts, and on thirteen which required packing.

There have been six new gate boxes set, six raised and five reset. The total number of gates now in use is 430.

A connection was put in at the corner of Nashua street and Montvale avenue in order to benefit the residents of Nashua street, regardless of which side of the gate there is a break.

By the construction of this connection the residents of this section received much benefit, as in years past when a break occured on Montvale avenue they were deprived of their water supply during the time consumed in repairing a break.

HYDRANTS.

Repairs have been made on 16 hydrants during the year. Two have had to be dug up and replaced by new hydrants.

Two were raised and five were replaced.

They have been given their usual inspection and have been blown off once.

I would recommend that the "Boston Post" hydrant now in use be replaced with new hydrants of improved make. I would also recommend that in the future when setting hydrants, a gate be set on the branch, so that when a hydrant has to be taken out for repairs it can be done without shutting off a section of the pipe, thereby causing inconvenience to water takers.

METERS.

There are now 63 meters in use. During the year nine have been replaced and set and one has been tested.

SHOPS.

The shop and barn on Cove street are in a deplorable condition. I recommend that a small sum of money be appropriated to make such repairs as are necessary.

RECOMMENDATIONS.

Under this heading I wish to call your attention to the following additions and improvements which should be made to our pipe system :

1. A section of about 1000 feet of 4-inch cement lined pipe on Main street opposite the Boston and Northern Street Railway Company car station, north to the Wilmington line.

This line of pipe was struck by lightning seven years ago, and in the above space we had 73 leaks. I would recommend that this pipe be replaced by a 6-inch pipe from the car station to the Wilmington line.

2. I recommend that a 6-inch pipe be laid in the place of the 4-inch now in on Nichols and Poole streets, from Main street to connect with a 6-inch pipe on Winter street, already in.

3. The 4-inch pipe on North Warren street and Harrison avenue be replaced with a 6-inch, as this was weakened six years ago by lightning. The 4-inch pipe on Munroe and Morse streets is large enough to supply the present wants, but this line was weakened seven years ago by lightning and should be replaced with a new 4-inch main.

4. Part of Garfield avenue and Carter street were also considerably damaged by lightning and should be replaced.

5. I would recommend that the 6-inch main in Lexington street be extended to the watering trough at the junction of Cambridge and Lexington streets, a distance of 6200 feet. There should be 5 hydrants and 2 gates placed on this line.

I recommend the laying of this main not for revenue, but as a benefit to our system on that side of the City. At present the water on Cambridge street is dependent upon the Bedford street main, and whenever a break occurs on Bedford street beyond South Bedford street, this whole section has to be shut off. When repairs are necessary it takes two men one-half day to notify water takers that the water will be shut off, and in the spring and summer when market gardeners are busy setting out small plants the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection. By putting in this main we would have a good circulation of water and additional pressure for fire purposes.

6. I recommend that a new 6-inch main be laid in Abbott street.

7. I recommend that a 4-inch pipe be laid in Park street from its junction with Centre to Franklin street, a distance of 700 feet, to replace a 1-inch temporary main.

8. I recommend that a 6-inch main be laid in Broad street from Wade avenue to Montvale avenue, a distance of 572 feet. At present there is but a 1-inch temporary main, which does not furnish an adequate supply.

9. I recommend the laying of a 6-inch main in Harrison avenue from North Warren street to the railroad bridge a distance of 816 feet. At present when there is a leak on North Warren street, it shuts off a considerable section, whereas by putting in the above main, it would overcome this difficulty.

10. I recommend that a 6-inch main be laid in Thorn street from Central street to Washington street, a distance of 550 feet, with one hydrant. There are six houses on this street which are all supplied with a 1-inch temporary main, and there is considerable trouble on account of this pipe freezing.

11. I recommend that a 6-inch main be laid in Auburn street from a point opposite Jaquith's stable on High street, a distance of 200 feet, which would connect two dead ends.

12. I recommend that a 6-inch pipe be laid in Pearl street from Webster street a distance of 980 feet. When a break occurs above School street, the water must be shut off on Main street a distance of 5,500 feet and on Nichols, Poole, Webster, Winter, Mountain and Minot streets, and also on a section of Pearl street. By constructing this main it would be a great benefit to the many families residing on the above streets and to three manufacturing establishments who are, during the time consumed in repairing a break, deprived of their water supply.

13. I recommend that the 10-inch cement lined pipe on Montvale avenue from Green street to a point beyond the railroad bridge, be taken up and replaced with a 10-inch cast iron main. This line of pipe has developed signs of weakness lately that in my opinion, are sufficient for its renewal with the above.

Respectfully submitted,

ROBERT T. SPENCER

Superintendent.

REPORT OF WATER REGISTRAR FOR 1904

WOBURN, MASS., December 31, 1904.

To the Commissioner of Water and Water Supply:—

SIR—I have the honor to present the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1904.

REVENUE AND EXPENDITURES.

SERVICE CONSTRUCTION.

REVENUE.

Received for labor and material	$116.64	
Transfer from maintenance account	486.31	
		$602.95

EXPENDITURES.

Services		$602.95
Cost of Waterworks to December 31, 1903	$603,182.68	
Construction for year ending December 31, 1904, less amount turned into City Treasury	486.31	
		$603,668.99

MAINTENANCE.

REVENUE.

Rent of house	$120.00	
Sundry receipts	791.89	
		$911.89
Water Rate Collections:		
1900 Account—		
Domestic rates	$18.00	
Fines	.50	
		$18.50
1901 Account—		
Domestic rates	$18.00	
Fines	.50	
		$18.50
1902 Account—		
Domestic rates	$34.00	
Fines	1.00	
		$35.00
1903 Account—		
Domestic rates	$413.70	
Meter rates	24.12	
Fines	11.25	
	$449.07	
Abatements	5.00	
		$444.07
Amount carried forward,		$1,427.96

Amount brought forward,		$1,427.96
1904 Account—		
Domestic rates	$36,254.37	
Fractional rates	490.21	
Meter rates	8,913.55	
Fines	121.50	
Seals	63.50	
	$45,843.13	
Abatements	528.90	
		$45,314.23
Total Collections for 1904		$46,742.19

EXPENDITURES.

Maintenance:		
Ditch, derrick and gear	$40.00	
Expressing	12.62	
Miscellaneous	763.55	
Miscellaneous labor	416.42	
New gates and valves	203.00	
Repairs to drinking fountains	33.49	
Repairs to gates	156.53	
Repairs to hydrants	104.79	
Repairs to meters and meter pits	180.10	
Repairs to services	1,194.77	
Repairs to standpipes	21.52	
Repairs to street mains	2,318.14	
Repairs to wagons	138.92	
Reservoir (cleaning, etc.)	75.24	
Salary (Superintendent)	1,175.07	
Sharpening picks, bars and tools	52.65	
Stable	468.47	
Supplies	184.53	
Telephones	58.11	
Trench pump, hose and fittings	89.30	
		$7,687.22

Amount brought forward,		$7,687.22
Pumping station:		
Care of grounds	$59.05	
Expressing	4.65	
Fuel	4,388.68	
Lighting	22.30	
Oil, waste and packing	142.20	
Repairs on boilers	217.68	
Salaries	3,096.38	
Supplies, tools, etc.	183.13	
Teaming ashes	24.50	
Telephone	31.79	
Wiring station for electric lights	75.00	
		$8,245.36
Office:		
Books, paper and stationery	$76.30	
Expressing	.15	
Office supplies	6.80	
Salaries	900.77	
		$984.02
Total expenditures 1904		$16,916.60
Transfer to interest on water debt		$1,652.00
Transfer to service construction acc't		486.31
Transfer to sinking fund of 1874		27,687.28
		$46,742.19

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1903 INCLUSIVE.

Year	No. S'rvic's	Receipts	Expenditures			Surplus
			Maintenance	Interest	Total	
1872	......	....	....	$6,165.76	$6,165.76	‡$6,175.76
1873	498	$4,600.00	$4,976.99	11,424.37	16,401.36	‡11,801.36
1874	734	16,755.30	9,457.29	20,329.50	29,786.79	‡13,031.49
1875	835	17,117.25	7,166.44	24,500.00	31,666.44	‡14,549.19
1876	992	19,886.96	8,603.84	24,500.00	33,103.84	‡13,216.88
1877	1,084	22,508.03	6,848.84	25,108.59	31,957.43	‡9,449.40
1878	1,208	23,975.08	7,393.30	25,125.00	32,518.30	‡8,543.22
1879	1,290	24,060.29	7,527.40	25,798.60	33,326.00	‡8,265.71
1880	1,361	25,793.61	10,336.61	26,441.00	36,777.61	‡10,984.00
1881	1,413	27,608.62	8,291.00	26,741.00	35,032.00	‡7,423.38
1882	1,487	27,447.84	9,877.59	27,041.00	36,918.59	‡9,470.75
1883	1,559	29,925.52	9,276.27	27,041.00	36,317.27	‡6,391.75
1884	1,627	30,010.77	7,691.76	27,041.00	34,732.76	‡4,721.99
1885	1,730	30,999.51	8,974.37	27.041.00	36,015.37	‡5,015.86
1886	1,844	32,654.27	10,292.99	27,397.13	37,690.12	‡5,035.85
1887	1,966	34,266.65	†13,326.90	27,073.50	40.400.40	‡6,133.75
1888	2,061	34,002.02	10,697.99	16,982.50	27,680.49	6,321.53
1889	2,154	36,524.03	11,134.84	26,035.56	37,170.40	‡646.37
1890	2,233	37,944.36	12,351.11	25,306.75	37,657.86	336.50
1891	2,302	37,756.57	13,049.45	24,577.75	37,627.20	1 9.37
1892	2,369	37,405.88	11,033.61	24,483.75	35,517.36	2,888.52
1893	2,464	41,106.00	15,980.64	17,692.58	33 673.22	7,432.78
1894	2,559	42,528.48	12,629.09	12,985.75	25,614.84	16,913.64
1895	2,628	44,828.39	13,241.98	11,271.75	24,513.73	20,314.66
1896	2,709	45,750.29	20,671.20	10,070.00	30,741.20	15,009.09
1897	2,773	47,634.56	19,407.23	8,936.00	28,343.23	19,291.33
1898	2,821	48,013.24	11,164.80	7,812.00	18,976.80	29,036.44
1899	2,869	48,056.26	10,748.75	6,626.00	18,374.75	30,721.51
1900	2,894	§44,201.44	13,450.68	5,725.38	19,176.06	25,025.38
1901	2,925	‖42,814.87	11,627.99	4,774.00	16,401 09	26,412.88
1902	2,962	‖42,857.58	13,251.55	3,676.00	16.927.55	25,930.03
1903	2,996	‖47,616.21	13,995.10	2,660.00	16,655.10	30,961.11
1904	3,021	¶‖46,742.19	16,916.60	1,652.00	18,568 60	28,173.59
		1,094,482.07	361,394.20	590,036.22	951,430.42	288,052.89

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* Ten months.
† In this amount is included $1,000 transferred to construction account.
‡ Deficiency.
§ Appropriation for hydrant service reduced from $5,050 to $1,730.
‖ No appropriation for hydrant service.
¶ Water rates on Schools amounting to $537.00 not paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita, for domestic and other purposes.

	WATER PUMPED.			CONSUMPTION PER CAPITA.			
				Annually.		Daily.	
Year	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons.	For all Purposes Gallons.	Domestic Purposes Gallons.	For all Purposes. Gallons
†1873-74..	99,522,564	....	99,522,564	*10,625.94	*10,625.94	70.47	70.47
1874-75..	228,114,068	13,946,060	242,060,128	28,841.35	25,298.92	65.81	69.31
1875-76..	253,070,098	13,573 566	266,643,664	25.718.55	27,026,78	70.46	74.04
1876-77..	225,350,577	18,775,415	244.125,992	32,285.46	24,142.20	61.05	66.14
1877 78..	162,523.918	24 843,325	187,367,243	15,649.94	18,070.90	42.87	49 51
1878-79..	202,212,585	30,414.959	237,627,544	19,535 80	22,295.69	53.52	61.08
1879-80..	226,167,598	41,671.685	267,839,283	20 691.39	34,502.72	56.68	67.13
1880-81..	239,085,793	30.460 765	269,546 558	21,550.90	24.296.60	59.04	66.56
1881-82..	250,489.800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882-83..	269,660,902	31,566,923	301,227,825	23 609.20	26,372.59	64.68	72.25
1883-84..	214,940.593	37,978,384	252 918,977	18,551.75	21.829.70	50 82	59 80
1884 85..	187.874,878	43,341,199	231,216,977	15,989.35	19.667.96	43.80	53.91
1885-86..	218,303,505	33,042.819	251,346.324	18,043.10	20.774.14	49.43	56.91
1886-87..	312,407,520	22.012.063	344,419,580	25,094.98	26,863.16	68.75	73 59
1887-88..	285,924.528	38 363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
†1888	193,639,657	41.854.103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889	219,416,786	36,125 854	253,542,590	16,686.95	19.282 27	45.71	52 82
1890	251,052,891	42.732,509	293,805,400	18.597.88	21.764.97	50.95	59.63
1891	241.450,716	39,370,734	280,821,450	17,709.45	20,596.40	48·51	56 42
1892	248.856,570	43,719,280	292,575,850	18.072.37	21,247·33	49.51	58.21
1893	284,481 937	53,434 313	337.916,250	20.457.49	24.300.03	56 04	66.57
1894	313,450,904	57.566,396	361,017,300	22.322 38	25,709.82	61.15	70 43
1895	317,570 332	67,951,868	385,522 200	22,398.81	27,191.57	61 36	74.49
1896	324,880,999	50.586.401	375,467,400	22,786 01	26.333.80	62.45	72.14
1897	309.634,781	57,696,169	367.330,950	21,595.43	25,619.39	59.16	70.19
1898	314.896,516	48,127,334	363,023,850	21.839 00	25,176.76	59.83	68.97
1899	358.980.560	46,048,540	405,029,100	24.757.28	27,933 04	67 83	76.53
1900	374,863.730	42,572,170	417.435,900	26,298.84	29,285 52	72.05	80.23
1901	380.42 ,649	46.217.451	426.638 100	26,602.84	29,834 83	72.88	81.74
1902 ...	403,426.680	41,255,670	444,682,350	28,310.64	31,205.78	77 56	85 49
1903	433.632,792	69,364,458	502.997.250	30,537.52	35.422.34	83 66	97.04
1904	453 058,373	67,226,077	520,284.450	31,793.57	36,511.18	87.10	100.03

† Five months. ‡ Ten months. * Five months.

STATEMENT OF EXPENSES BY MONTHS.

MONTHS	MAINTENANCE		PUMPING STATION		OFFICE		TOTALS	
	PAY ROLL	SUPPLIES	PAY ROLL	SUPPLIES	Pay Roll	Supplies	1904	1903
January	$342 97	$245 92	$323 58	$291 98	$86 50	$7 75	$1,298 70	$2,091 97
February	459 02	247 11	286 36	124 32	69 20	....	1,186 01	653 12
March	466 74	192 49	304 62	665 90	86 50	....	1,716 25	829 87
April	289 08	202 00	285 02	338 26	70 37	....	1,184 73	1,140 95
May	393 77	260 36	270 95	284 62	69 20	2 75	1,281 65	1,338 44
June	412 65	346 24	308 65	596 62	95 50	....	1,759 66	1,342 70
July	786 81	362 56	249 93	298 70	69 20	22 45	1,789 65	1,273 35
August	432 66	357 46	234 00	361 10	78 20	....	1,463 42	787 78
September	387 34	141 98	293 40	488 33	86 50	47 85	1,445 40	782 71
October	324 64	163 09	269 28	348 48	67 20	....	1,172 69	2,017 62
November	366 60	147 24	255 47	374 81	61 20	75	1,206 07	509 12
December	264 16	94 33	280 27	710 71	61 20	1 70	1,412 37	1,247 47
	$4,926 44	$2,760 78	$3,361 53	$4,883 83	$900 77	$83 25	$16,916 60	$13,995 10

The following is a statement of meters in use together with those on hand:

MAKE	5-8 inch	3-4 inch	1 inch	1½ inch	2 inch	4 inch	Total
Crown	..	4	6	1	6	..	17
Empire	..	1	1	1	..	..	3
Gem	..	..	..	..	..	2	2
Hersey	..	5	12	1	5	1	24
Indicator	..	..	..	..	1	..	1
Nash	..	..	1	..	..	..	1
Neptune	..	13	..	..	2	..	15
Thompson	..	6	2	2	1	..	11
Union	1	3	10	4	5	..	23
Worthington	..	..	7	1	8	..	16
Total	1	32	39	10	28	3	113

WATER SERVICE.

Whole number put in to December 31, 1903	2,996
Number added in 1904	25
Total	3,021
Total number abandoned	62
Vacant services	54

VACANCIES

Shut-off for non-payment	11
Turned on upon payment	7
Number remaining shut-off for non-payment	4
Faucets locked	368
Faucets unlocked	326

NUMBER OF FIXTURES.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Total Jan. 1 1905	Total Jan. 1 1904
Faucets	1,070	977	1,106	1,432	383	663	258	5,889	5,841
Bath Tubs	133	10	128	158	35	99	17	671	650
Water Closets	424	356	376	564	65	138	35	1,958	1,909
Hose Attachments	91	115	133	130	37	94	35	635	635
	1,718	1,549	1,743	2,284	520	994	345	9,153	9,035

STATEMENT OF INCOME.

	1900	1901	1902	1903	904
Domestic Service	$35,453 61	$35,816 45	$35,956 90	$38,913 23	$36,892 63
Meter Service	6,172 65	6,114 33	5,929 31	7,958 45	8,937 67
Totals	$41,626 26	$41,930 78	$41,886 21	$46,871 68	$45,830 30

UNCOLLECTED WATER RATES.

Domestic rates, 1903	$54.51
Domestic rates, 1904	772.91
Fractional rates	41 76
Meter rates	317.72
	$*1,186.90

*Water rates on Schools, amounting to $537.00, not paid.

WATER TAKERS.

Classification.	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals.	
								Jan. 1 1905	Jan. 1 1904
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	3	1	1	..	..	..	5	5
Bakehouses	..	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	5	..	..	6	6
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	427	478	475	486	215	365	336	2 782	2,763
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevators	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	1	2	1	2	1	7	7
Families	597	674	652	678	262	423	185	3,471	3,453
Foundries	..	1	..	..	1	..	..	2	2
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	3	..	1	6	7	9	27	26
Halls, Clubs, etc.	5	1	10	14	1	1	..	32	32
Hose and Fountains	90	115	132	129	36	94	32	628	628
Hotels	1	1	1	..	..	..	..	3	3
Hydrants	47	63	47	58	40	72	35	362	362
Irrigation	..	..	5	..	4	7	13	29	29
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	16	4	4	2	13	1	43	43
Motors	1	..	2	4	..	..	..	7	7
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	1	2	..	..	..	3	3
Private Hydrants	..	..	..	..	..	2	..	2	2
Public Library	..	..	1	..	..	..	..	1	1
Public Parks	..	..	..	..	..	1	..	1	1
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	12	6	10	4	..	..	..	32	32
School Houses	4	1	2	2	3	2	2	16	16
Stables	50	73	50	24	57	44	30	328	327
Stores Shops and Offices	21	37	57	186	10	11	3	325	321
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	7	..	1	..	17	17

COAL CONSUMED AND DUTY OF PUMPING ENGINES.

1904	Number of Hours Pumping	Pounds of Coal Used Firing and Banking	Pounds of Coal Used Pumping.	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir in Feet	Average Height of Pond Above High Water Mark —Inches
January*	454	9.600	173.400	49,274.400	1,524,980.6	269	210 7	14.7	23.9
February	433	8,900	162,500	45,849 300	1,581,010	267 5	210.8	14.8	24 5
March	336½	15,700	155,700	44,452,800	1,433,961	259.3	213.9	17.9	27
April	328	15 400	133,800	39.035 850	1,301,195	261	213 4	17.4	26
May	337½	13 500	119,300	37,080,750	1,196 153	279.2	211.3	15.3	24.7
June	328½	15.500	127.600	39.212,250	1,307.075	274	211 6	15.6	25.3
July	370	17.200	150,800	47,258,150	1,524,295	281	211 7	15.7	23 5
August	341	20.700	156 900	48,877,500	1,576 693.5	275	212.4	16.4	25.4
September	330	18,000	145.300	43,276,800	1,442.560	265	213.3	17 3	23.3
October	335½	17,000	134 600	41.160.000	1 327,741.9	271.5	212.9	16.9	25.7
November† ...	347	15,600	136 600	41,975 850	1,315,861 6	275.7	212.3	16.3	26 2
December.....	339	19,200	179,700	42,835,800	1,381,800	283.6	211.8	15.8	26.4
Total	4,280	186,300	1,776,200	520,284.450	1,413,108	265	212.2	6 2	25.2

* During this month 2,000,000 gallons were used filling reservoir, making an actual daily average consumption of 1,524,980 6 gallons.

† During this month 2,500,000 gallons were used cleaning and filling reservoir, making an actual daily average consumption of 1.351,861.6 gallons.

Number of gallons pumped, 1903	502,997,250
Number of gallons pumped, 1904	520,284,450
Coal used in 1903	976 14 20 tons
Coal used in 1904	981 5-20 tons

SUMMARY OF STATISTICS.

FOR THE YEAR ENDING 1904.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

CITY OF WOBURN, MIDDLESEX COUNTY, STATE OF MASSACHUSETTS.

Population by Census of 1900, 14,250.
Date of Construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery near Horn Pond.
Mode of supply, Pumping direct and to reservoir.

PUMPING.

1. Builders of Pumping Machinery, Worthington & Blake.
2. Description of Fuel used, (a) Kind, Bituminous Coal ; (b) Brand of coal, Carbon, New River ; (c) Average price of coal per gross ton, delivered, $5.63 ; (d) Percentage of ash, 9 ; (e) Wood, price per cord, none used.
3. Coal consumed for the year, 1,962,500 lbs.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 520,284,450 gallons, without allowance for slip.

7. Average static head against which pumps work, 196.2 feet.

8. Average dynamic head against which pump work 214.2 feet.

9. Number of gallons pumped per pound of equivalent coal (5), 265.

10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (5). Equals 47,360,545.7.

Cost of pumping, figured on pumping station expenses, viz., $8,245.36.

11. Per million gallons pumped, $15 856.

12. Per million gallons raised one foot (dynamic), $0.074,

Cost of pumping, figured on total maintenance, viz., $16,916.60.

13. Per millions gallons pumped, $32.53.

14. Per million gallons raised one foot (dynamic) $0.1518.

FINANCIAL.

MAINTENANCE.

RECEIPTS.

From Consumers :

A.	Water rates, fixture..........	$36,112.63	
B.	Water rates, meter............	8,937.67	
C.	Net receipts for water, (A) plus (B)......................	$45,050.30	
D.	Miscellaneous (rent, repairs, sales, etc)....................	911.89	
E.	Total from consumers.........		$45,962.19

	Amount brought forward,		$45,962.19
	From Public Funds :		
F.	Hydrants	......	
G.	Fountains	$275.00	
H.	Street waterings	250 00	
I.	Public buildings	255.00	
J.	General appropriations	......	
	Total from public funds		$780.00
K.	Gross receipts from all sources		$46,742.19

EXPENDITURES.

AA.	Management and repairs	$16,916.60	
BB.	Interest on Bonds	1,652.00	
CC.	Total maintenance for year		$18,568.60
DD.	Transfer to Service Construction Account		486.31
DDD.	Ballance transferred to Sinking Fund		27,687.28
K.	Total		$46,742.19

FINANCIAL.

CONSTRUCTION (Service.)

RECEIPTS.

Q.	From balance of previous year	....	
R.	From bonds issued	....	
S.	From Appropriations from tax levy	....	
T.	Transferred from Maintenance Account	$486.31	
U.	From other sources	116.64	
V.	Total		$602.95

EXPENDITURES.

FF.	Extension of mains........................	....
GG.	Extension of services.....................	$602,95
JJ.	Total construction for year..............	$602.95
W.	Net cost of works to date................	603,668.99
X.	Bonded debt at date.....................	19.700.00
Y.	Value of Sinking Fund at date...........	....
Z.	Average rate of interest, 4 per cent.	

CONSUMPTION.

1. Estimated total population at date, 14,250.
2. Estimated population on line of pipe, 14,200.
3. Estimated population supplied, 14,200.
4. Total consumption for the year, 520,284,450 gallons.
5. Passed through meters, 67,226,077.
6. Percentage of consumption metered, .129.
7. Average daily consumption, 1,413,108.
8. Gallons per day to each inhabitant, 100 03.
9. Gallons per day to each consumer.
10. Gallons per day to each tap, 467.76.

DISTRIBUTION.

MAINS.

1. Kind of pipe, cement and cast iron.
2. Sizes, from 4 inch to 14 inch.
3. Extended during year.
4. Discontinued——feet during year.
5. Total now in use, 54.76 miles.
6. Cost of repairs per mile, $44.16.
7. Number of leaks per mile, 1.077.
8. Length of pipes less than 4 inches diam., 5.3 miles,

9. Number of hydrants added during year (public and private), 0.
10. Number of hydrants (public and private), now in use, 361.
11. Number of stop gates added during year, 2
12. Number of stop gates now in use, 430.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow-off gates, 17,
15. Range of pressure on mains at centre of city, 70 lbs. to 75 lbs.

SERVICES.

16. Kind of pipe, lead lined and cement lined.
17. Sizes, 1 inch.
18. Extended——feet.
19. Discontinued——feet.
20. Total now in use,——miles.
21. Number of service taps added during year, 25.
22. Number now in use, 3,021.
23. Average length of service,——feet.
24. Average cost of service for the year, $24.12.
25. Number of meters added, 1.
26. Number now in use, 65.
27. Percentage of service metered, .0215.
28. Percentage of receipts from metered water (B divided by C.), .198.
29. Number of motors and elevators added,——.
30. Number now in use, 9.

Respectfully submitted,

REDMOND E. WALSH,

Water registrar.

1905

MASS. STATE BOARD OF HEALTH,
ENGINEER'S OFFICE

ANNUAL REPORT

OF THE

Water Department

OF THE

CITY OF WOBURN

FOR THE YEAR 1905.

THE NEWS PRINT, WOBURN
1906.

R E Walch
Water Registrar

REPORT OF

WATER DEPARTMENT.

REPORT OF THE SUPERINTENDENT OF WATER WORKS.

WOBURN, MASS., Dec. 31, 1905.

To the Commissioner of Water and Water Supply:—

Sir.—I have the honor to submit the following report upon the condition of the works and the operations of the department for the year ending December 31, 1905.

RESERVOIR.

I renew my recommendations of past years that the bottom and side walls be concreted. This would necessitate the blasting out of a portion of the bottom and the cutting off a section of the back. This improvement would facilitate the cleaning and at the same time prevent unnecessary waste which under present conditions is considerable. No complaints have been received as to the quality of the water which has been of a high standard during the year. The average depth during the year was 16 and five-tenths feet.

PUMPING STATION AND GROUNDS.

The plant is in a good condition and has performed satisfactory service. The grounds about the station have received their usual care.

WATER SUPPLY.

I would like to call your attention to the inadequate means of supplying water to the wells. The filter gallery becomes clogged up with sediment from the water and the result is that the water supply becomes low at times.

I would recommend that immediate action be taken to remedy this defect.

CONSTRUCTION.

There have been no new mains constructed during the year. The total number of feet laid to December 31, 1905, is two hundred and eighty-nine thousand, five hundred and one (289,501) feet, or four thousand, three hundred and eight-one (4,381) feet over fifty-four (54) miles.

SERVICES.

The total number of new services laid during the year was thirty-six (36).

REPAIRS ON SERVICES.

Repairs of different kinds have been made on 252 services, divided as follows: 17 leaks, 36 cleaned, 23 renewed, 103 frozen, 73 general repairs and 98 were shut off for repairs.

SERVICE BOXES.

There have been 42 new boxes set, 41 dug up and reset, 53 raised to conform to grade and 142 lowered.

REPAIRS TO MAINS.

The total number of breaks in mains during the ye r was 53. There were 40 on 4-inch, 9 on 6-inch, 2 on 8-inch, and 2 on 10-inch. Of the above, 29 were caused by lightning, 11 by thin lining, 5 by rust. 3 by closing of hydrants and 5 were joint leaks.

REPAIRS ON GATES AND GATE BOXES.

Five new gates have been added to our system. Repairs have been made on ten which required packing. There have been thirteen new gate boxes set, four raised, two lowered and four reset. In addition to the above, one new gate head and cover have been set.

The total number of gates now in use is four hundred and thirty-five.

HYDRANTS.

Repairs have been made on twenty-one hydrants. Two have been dug up and replaced by new ones. Four were raised and eight replaced. They have been given their usual inspection and have been blown off once.

I would recommend that the "Boston Post" hydrant now in use be replaced with new hydrants of improved make.

I would also recommend that in the future when setting hydrants, a gate be set on the branch, so that when a hydrant has to be taken out for repairs it can be done without shutting off a section of the pipe, thereby causing inconvenience to water takers.

METERS.

There are now 66 meters in use. During the year 16 have been replaced and set. Sixteen have also been tested.

SHOPS.

The shop and barn on Cove street are badly in need of repairs. I would recommend that they be given immediate attention.

The estimated cost to put these buildings in good repair is about $300.00.

RECOMMENDATIONS.

Under this heading I wish to call your attention to the following additions and improvements which should be made to our pipe system:

1. A section of about 1,000 feet of 4-inch cement lined pipe on Main street opposite the Boston and Northern Street Railway Company car station, north to the Wilmington line. This line of pipe was struck by lightning eight years ago and in the above space we had 73 leaks. I would recommend that this pipe be replaced by a 6-inch pipe from the car station to the Wilmington line.

2. I recommend that a 6-inch pipe be laid in the place of the 4-inch now in on Nichols and Poole streets, from Main street to connect with a 6-inch pipe on Winter street already in.

3. The 4 inch pipe on North Warren street and Harrison avenue be replaced with a 6-inch; as this was weakened seven years ago by lightning. The 4-inch pipe on Munroe and Morse streets is large enough to supply the present wants, but this line was weakened eight years ago by lightning and should be replaced with a new 6-inch pipe.

4. Part of Garfield avenue and Carter street were also considerably damaged by lightning and should be replaced.

5. I would recommend that the 6-inch main in Lexington street be extended to the watering trough at the junction of Cambridge and Lexington streets, a distance of 6,200 feet. There should be five hydrants and 2 gates placed on this line. I recommend the laying of this main, not for revenue, but as a benefit to our system on that side of the City.

At present the water on Cambridge street is dependent upon Bedford street main, and whenever a break occurs on Bedford street beyond South Bedford street, this whole section has to be shut off.

When repairs are necessary it takes two men one-half day to notify water takers that the water will be shut off, and in the spring and summer when market gardeners are busy setting out small plants, the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection.

By putting in this main we would have a good circulation of water and additional pressure for fire purposes.

6. I recommend that a new 6-inch main be laid in Abbott street.

7. I recommend that a 4-inch pipe be laid in Park street from its junction with Centre to Franklin street, a distance of 700 feet, to replace a 1-inch temporary main.

8. I recommend that a 6-inch main be laid in Broad street from Wade avenue to Montvale avenue, a distance of 572 feet. At present there is but a 1-inch temporary main, which does not furnish an adequate supply.

9. I recommend that a 6-inch main be laid in Thorn street from Central to Washington street, a distance of 550 feet, with one hydrant. There are six houses on this street which are all supplied with a 1-inch temporary main, and there is considerable trouble on account of this pipe freezing.

10. I recommend the laying of a 6-inch main in Harrison avenue from North Warren street to the railroad bridge, a distance of 816 feet. At present when there is a leak on North Warren street, it shuts off a considerable section, whereas by putting in the above main, it would overcome this difficulty.

11. I recommend that a 6-inch main be laid in Auburn street from a point opposite Jaquith's stable on High street, a distance of 200 feet, which would connect two dead ends.

12. I recommend that a 6-inch pipe be laid in Pearl street from Webster street a distance of 980 feet. When a break occurs above School street the water must be shut off on Main street a distance of 5,500 feet and on Nichols, Poole, Webster, Winter, Mountain and Minot streets and also on a section of Pearl street. By constucting this main it would be a great benefit to the many families residing on the above streets and to the manufacturing establishments who are, during the time consumed in repairing a break, deprived of their water supply.

13. I recommend that the 10-inch cement lined pipe, on Montvale avenue from Green street to a point beyond the

railroad bridge, be taken up and replaced with a 10-inch cast iron main. This line of pipe has developed signs of weakness lately that in my opinion, are sufficient for its renewal with the above.

Respectfully submitted,

ROBERT T. SPENCER,
Superintendent.

REPORT OF WATER REGISTRAR FOR 1905.

Worurn, Mass., December 31, 1905.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to present the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1905.

REVENUE AND EXPENDITURES.

SERVICE CONSTRUCTION.

Revenue.

Received for labor and material......	$216.70	
Transfer from maintenance account..	462.16	
		$678.86

Expenditures.

Services.........................		$678.86
Cost of Waterworks to December 31, 1904.........................	$603,668.99	
Construction for year ending December 31, 1905, less amount turned into City Treasury..............	462.16	
		$604,131.15

MAINTENANCE.

REVENUE.

Rent of house	$120.00	
Sundry receipts	668.71	
		$788.71
Water Rate Collections:		
1901 Account—		
Domestic rates	$15.50	
Fines	2.50	
		$18.00
1903 Account—		
Domestic rates	$22.75	
Fines	1.00	
		$23.75
1904 Account—		
Domestic rates	$528.34	
Fines	13.50	
Meter rates	82.27	
	$624.11	
Abatements	11.17	
		$612.94
1905 Account—		
Domestic rates	$36,374.46	
Fines	124.25	
Seals	59.25	
Meter rates	7,639.44	
Fractional rates	780.23	
	$44,977.63	
Abatements	499.61	
		$44,478.02
Total Collections for 1905		$45,921.42

EXPENDITURES.

Maintenance:		
Driving test wells	$350.00	
Expressing	16.14	
Miscellaneous	313.67	
Miscellaneous labor	689.98	
New Concord wagon	140.00	
New gates and valves	354.00	
New gate and service boxes	136.40	
New harness	22.00	
New horse	200.00	
New hydrants	336.00	
Repairs to drinking fountains	27.46	
Repairs to gates	108.42	
Repairs to hydrants	290.57	
Repairs to meters and meter pits	147.55	
Repairs to services	1,366.63	
Repairs to standpipes	21.22	
Repairs to street mains	1,164.00	
Repairs to wagons	49.65	
Salary (Superintendent)	1,200.00	
Sharpening picks, bars and tools	35.62	
Stable	409.20	
Supplies	565.87	
Telephones	56.53	
		$8,000.91
Pumping Station:		
Building cesspool	$60.15	
Care of grounds	58.98	
Expressing	4.05	
Fuel	3,577.09	
Insurance (boilers)	100.00	
Lighting	37.83	
Amount carried forward,	$3,838.10	

Amount brought forward,	$3,838.10	
Oil, waste and packing	191.51	
Repairs to boilers	51.06	
Repairs to pumps	119.69	
Salaries	3,122.01	
Supplies, tools, etc	139.93	
Teaming ashes	13.00	
Telephone	31.84	
		$7,507.14
Office:		
Books, paper and stationery	$71.15	
Expressing	.20	
Office supplies	11.24	
Salaries	916.50	
		$999.09
Total expenditures 1905		$16,507.14
Transfer to interest on water debt		608.00
Transfer to service construction acc't		462.16
Transfer to sinking fund		28,344.12
		$45,921.42

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1905 INCLUSIVE.

Year	No. S'rvic's	Receipts	Expenditures			Surplus
			Maintenance	Interest	Total	
1872	......	....	....	$6,165.76	$6,165 76	‡$6,175.76
1873	498	$4,600.00	$4,976.99	11,424.37	16,401.36	‡11,801.36
1874	734	16,755.30	*9,457.29	20,329.50	29,786.79	‡13,031.49
1875	835	17,117.25	7,166.44	24,500.00	31,666.44	‡14,549.19
1876	992	19,886.96	8,603.84	24,500.00	33,103.84	‡13,216 88
1877	1,084	22,508.03	6,848.84	25,108.59	31,957.43	‡9,449.40
1878	1,208	23,975.08	7,393.30	25,125.00	32,518.30	‡8,543.22
1879	1,290	24,060,29	7,527.40	25,798.60	33,326,00	‡8,265.71
1880	1,361	25,793.61	10,336.61	26,441.00	36,777.61	‡10,984 00
1881	1,413	27,608.62	8,291.00	26,741.00	35,032.00	‡7,423.38
1882	1,487	27,447.84	9,877.59	26,041.00	36,918.59	‡9,470.75
1883	1,559	29,925.52	9,276.27	27,041.00	36,317.27	‡6,391.75
1884	1,627	30,010.77	7,691.76	27,041.00	34,732.76	‡4,721.99
1885	1,730	30,999.51	8,974.37	27,041.00	36,015.37	‡5,015 86
1886	1,844	32,654.27	10,292.99	27,397.13	37,690.12	‡5,035.85
1887	1,966	34,266.65	†13,326.90	27,073.50	40,400.40	‡6,133.75
1888	2,061	34,002.02	10,697.99	16,982.50	27,680.40	6,321.53
1889	2,154	36,524.03	11,134.84	26,035.56	37,170.49	‡646.37
1890	2,233	37,944.36	12,351.11	25,306.75	37,657.86	336.50
1891	2,302	37,756.57	13,049.45	24,577.75	37,627.20	129.37
1892	2,369	37,405.88	11,033.61	24,483.75	35,517.36	2,888.52
1893	2,464	41,106.00	15,980.64	17,692.58	33,673.22	7,432.78
1894	2,559	42,528.48	12,629.09	12,985.75	25,614.84	16,913.64
1895	2,628	44,828.39	13,241.98	11,271 75	24,513.73	20,314.66
1896	2,709	45,750.29	20,671.20	10,070.00	30,741.20	15,009.09
1897	2,773	47,634.56	19,407.23	8,936.00	28,343.23	19,291.33
1898	2,821	48,013.24	11,164.80	7,812.00	18,976.80	29,036.44
1899	2,869	48,096.26	10,748.75	6,626.00	18,374.75	30,721.51
1900	2,894	§44,201.44	13,450.68	5,725.38	19,176.06	25,025.38
1901	2,925	‖42,814.87	11,627.99	4,774.00	16,401.09	26,412.88
1902	2,962	‖42,857.58	13,251.55	3,676.00	16,927.55	25,930.03
1903	2,996	‖47,616.21	13,995.10	2,660 00	16,655.10	30,961.11
1904	3,021	¶‖46,742.19	16,916.60	1,652.00	18,568.60	28,173.59
1905	3,057	¶‖45,921.42	16,507.14	608.00	17,115.14	28,806.28
		1,140,403.49	377,901.34	590,644.22	968,545.56	316,859.17

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* Ten months.
† In this amount is included $1,000 transferred to construction account.
‡ Deficiency.
§ Appropriation for hydrant service reduced from 5,050 to 1,730.
‖ No appropriation for hydrant service.
¶ Water rates on schools amounting to $537.00 not paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita: for domestic and other purposes.

	WATER PUMPED.			CONSUMPTION PER CAPITA.			
				Annually.		Daily.	
Year	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons.	For all Purposes Gallons.	Domestic Purposes Gallons.	For all Purposes. Gallons
†1873-74..	99,522,564	....	99,522,564	*10.625 94	*10,625.94	70.47	70.47
1874-75..	228,114,068	13.946,060	242,060,128	28,841.35	25,298 92	65 31	69 31
1875-76..	253,070,098	13,573,566	266,643,664	25 718.55	27.026,78	70.46	74.04
1876-77..	225,350,577	18,775,415	244,125,992	32,285.46	24,142.20	61.05	66.14
1877 78..	162,523,918	24 843,325	187,367,243	15 649.94	18,070.90	42.87	49.51
1878-79..	202,212,585	30,414.959	237,627,544	19,535 80	22.295.69	53 52	61.08
1879-80..	226,167,598	41,671,685	267,839,283	20 691.39	34,502.72	56.68	67.13
1880-81..	239,085,793	30.460,765	269,546 558	21,550.90	24.296.60	59.04	66.56
1881-82..	250,489,800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882-83..	269,660,902	31,566,923	301.227,825	23 609.20	26,372.59	64.68	72.25
1883-84..	214,940.593	37,978,384	252 918,977	18.551.75	21.829.70	50.82	59 80
1884 85..	187,874,878	43.341,199	231,216,977	15,989.35	19.667.96	43 80	53.91
1885-86..	218,303,505	33,042.819	251,346.324	18,043.10	20,774.14	49.43	56.91
1886-87..	312,407,520	22.012 063	344,419,580	25,094.98	26,863.16	68 75	73 59
1887-88..	285,924,528	38.363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
‡1888	193,639,657	41.854.103	235.193.760	18.155.13	22.079.26	49.74	60.49
1889	219,416,786	36,125 854	253,542,590	16,686 95	19.282 27	45.71	52.82
1890	251,052,891	42.752,509	293 805.400	18.597.88	21.764.97	50.95	59.63
1891	241,450,716	39,370,734	280,821, 50	17,709 45	20,596.40	48 51	56.42
1892	248,856,570	43,719,280	292,575,850	18.072.37	21,247·33	49.51	58 21
1893	284,481 937	53,434 313	337 916,250	20,457.49	24.300 03	56.04	66.57
1894	313,450,904	57,566,396	361,017,300	22.322 38	25,709.82	61.15	70.43
1895	317,570.332	67,951,868	385,522 200	22,398.81	27,191.57	61 36	74.49
1896	324,880,999	50,586,401	375,467,400	22,786 01	26.333.80	62.45	72.14
1897	309,634,781	57,696,169	367.330,950	21,595.43	25,619.39	59.16	70.19
1898	314.896,516	48,127,334	363,023,850	21,839 00	25,176.76	59.83	68.97
1899	358.980,560	46,048,540	405,029,100	24,757.28	27,933.04	67.83	76.53
1900	374,863,730	42,572,170	417.435,900	26,298.84	29,285 52	72.05	80.23
1901	380,420,649	46.217,451	426,638,100	26.602.84	29,834 83	72.88	81.74
1902 ...	403,426,680	41,255,670	444,682,350	28,310.64	31,205.78	77 56	85.49
1903	433.632,792	69,364,458	502.997,250	30,537 52	35,422.34	83 66	97.04
1904	453 058,373	67,226,077	520.284.450	31,793 57	36.511.18	87.10	100.03
1905	480.566.720	63,240,630	543.807,350	33.372.61	37.764.4	91.42	103.46

† Five months. ‡ Ten months. * Five months.

STATEMENT OF EXPENSES BY MONTHS.

MONTHS	MAINTENANCE		PUMPING STATION		OFFICE		TOTALS	
	PAY ROLL	SUPPLIES	PAY ROLL	SUPPLIES	Pay Roll	Supplies	1905	1904
January	$374 37	$70 06	$276 14	$57 84	$86 50	$11 00	$875 91	$1,298 70
February	780 28	173 21	340 14	506 19	91 00	2 75	1,893 57	1,186 01
March	373 36	175 69	244 38	17 81	69 20	22 70	903 14	1,716 25
April	331 61	66 25	259 99	238 83	69 20	....	965 88	1,184 73
May	351 86	784 43	358 43	1,006 67	86 50	16 95	2,604 84	1,281 65
June	333 36	255 09	220 00	390 35	75 95	85	1,275 60	1,759 66
July	333 64	405 42	273 44	37 30	72 95	21 20	1,143 95	1,789 65
August	576 62	192 28	312 43	338 06	86 50	....	1,505 89	1,463 42
September	306 57	484 00	327 19	751 90	70 70	....	1,940 36	1,445 40
October	292 86	236 79	231 28	87 48	69 20	1 54	919 15	1,172 69
November	255 49	460 16	253 23	683 20	69 20	5 60	1,726 88	1,206 07
December	271 26	116 25	239 56	55 30	69 60	....	751 97	1,412 37
	$4,581 28	$3,419 63	$3,336 21	$4,170 93	$916 50	$82 59	$16,507 14	$16,916 60

The following is a statement of meters in use together with those on hand:

MAKE	5-8-inch	3-4-inch	1-inch	1¼-inch	2-inch	4-inch	Total
Crown	..	4	6	1	6	..	17
Empire	..	1	1	1	..	..	3
Gem	..	..	..	..	..	2	2
Hersey	..	5	12	1	5	1	24
Indicator	..	..	..	..	1	..	1
Nash	..	..	1	..	..	..	1
Neptune	..	13	..	..	2	..	15
Thompson	..	6	2	2	1	..	11
Union	1	3	10	4	5	..	23
Worthington	..	..	7	1	8	..	16
Total	1	32	39	10	28	3	133

WATER SERVICE.

Whole number put in to December 31, 1904	3,021
Number added in 1905	36
Total	3,057
Total number abandoned	64
Vacant services	54

VACANCIES.

Shut-off for non-payment	0
Turned on upon payment	2
Number remaining shut-off for non-payment	2
Faucets locked	379
Faucets unlocked	292

NUMBER OF FIXTURES.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Total Jan. 1 1906	Total Jan 1 1905
Faucets	1,073	990	1,112	1,452	398	678	261	5,964	5,889
Bath Tubs.......	133	103	131	169	39	103	17	695	671
Water Closets....	432	364	387	577	70	149	35	2,014	1,958
Hose Attachments	91	115	133	130	37	94	35	635	635
	1,729	1,572	1,763	2,328	544	1,024	348	9,308	9,153

STATEMENT OF INCOME.

	1901	1902	1903	1904	1905
Domestic Service.	$35,816 45	$35,956 90	$38,913 23	$36,892 63	$37,411 00
Meter Service....	6,114 33	5,929 31	7,958 45	8,937 67	7,721 71
Totals..........	$41,930 78	$41,886 21	$46,871 68	$45,830 30	$45,132 71

UNCOLLECTED WATER RATES.

Domestic rates, 1903..........................	$13.50
Domestic rates, 1904..........................	192.66
Domestic rates, 1905..........................	1,184.50
Fractional rates..................................	130.25
Meter rates	477.48
	$1,998 39

WATER TAKERS.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals Jan. 1 1906	Totals Jan 1. 1905
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	4	1	1	..	..	..	6	5
Bakehouses	..	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	7	..	..	8	6
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	428	479	477	488	222	373	338	2,805	2,782
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevators	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	1	2	1	2	1	7	7
Families	597	675	653	680	268	429	187	3,489	3,471
Foundries	..	1	..	..	1	..	..	2	2
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	3	..	1	7	7	11	30	27
Halls, Clubs, etc.	5	1	10	14	1	1	..	32	32
Hose and Fountains	90	115	132	129	36	94	32	628	628
Hotels	1	1	1	..	..	..	..	3	3
Hydrants	47	63	47	58	40	72	35	362	362
Irrigation	1	..	5	..	4	7	13	30	29
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	17	4	4	2	14	1	45	43
Motors	1	..	2	4	..	..	..	7	7
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	..	2	..	2	2
Public Library	..	..	1	..	..	..	..	1	1
Public Park	..	..	..	..	..	1	..	1	1
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	13	7	10	4	..	..	..	34	32
School Houses	4	1	2	2	5	2	2	16	16
Stables	50	73	50	24	57	44	30	328	328
Stores, Shops and Offices	21	38	57	187	10	11	3	327	325
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	7	..	1	..	17	17

COAL CONSUMED AND DUTY OF PUMPING ENGINES.

1905	Number of Hours Pumping	Pounds of Coal Used Firing and Banking	Pounds of Coal Used Pumping.	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir	Average Height of water in Pond Above High Mark
January	340½	19.800	162.300	45,856,650	1 479.246 7	251	213	17	26.6
February	377	15,100	161,900	45,749.300	1,637.475	259	211.4	15.4	27 4
March	344	12,400	158,600	46,018,350	1.484.462.9	269	211 9	15.9	27.9
April	330	13.000	150,500	42,284 550	1.409 485	258 6	213.1	17.1	26 7
May	341	15 300	170,700	47,385.450	1.528 562 9	254 7	212.6	16 6	25.9
June	330	21.200	151.700	46.363.800	1.545.460	268	213	17	26.5
July	399½	20.600	173,900	52,082,100	1 680,067.7	267.7	211	15	24 6
August	359	21 700	168 100	48,201,300	1.554 880.6	253.9	211.6	15.6	20.2
September	329½	16,100	133,200	39,645,900	1,321,530	265.5	212	16	22 8
October	339½	17,100	140 200	40,976,250	1.321,814.5	260.5	212.7	16.7	23.8
November	323½	19,100	151.200	42,659 400	1.421,980	250.5	213.7	17 7	23 5
December	336	22,100	158,800	46,584,300	1.502,719	257	213.9	17.9	23.8
Total	4,149½	213,500	1,881,100	543,807,350	1,489,883	259.6	212.5	16.5	24.9

Number of gallons pumped, 1904..............520,284,450
Number of gallons pumped, 1905..............543,807,350
Coal consumed in 1904......................981 5-20 tons
Coal consumed in 1905....................1,047 6-20 tons

SUMMARY OF STATISTICS.

FOR THE YEAR ENDING 1905.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

CITY OF WOBURN, MIDDLESEX COUNTY, STATE OF MASSACHUSETTS.

Population by Census of 1905, 14,400.
Date of Construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery near Horn Pond.
Mode of supply, Pumping direct and to reservoir.

PUMPING.

1. Builders of Pumping Machinery, Worthington & Blake.
2. Description of Fuel used, (a) Kind, Bituminous Coal; (b) Brand of coal, Carbon, New River; (c) Average price of coal per gross ton, delivered, $5.63; (d) Percentage of ash, 9; (e) Wood, price per cord, none used.
3. Coal consumed for the year, 2,094,600 lbs.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 543,807,350 gallons, without allowance for slip.

7. Average static head against which pumps work, 196.5 feet.
8. Average dynamic head against which pumps work 212.5 feet.
9. Number of gallons pumped per pound of equivalent coal (5), 259.6.
10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (5). Equals 46,011,772.

Cost of pumping, figured on pumping station expenses, viz., $7.507.14.

11. Per million gallons pumped, $13.80.
12. Per million gallons raised one foot (dynamic), $0.065.

Cost of pumping, figured on total maintenance, viz., $16,507.14.

13. Per million gallons pumped, $30,344.
14. Per million gallons raised one foot (dynamic) $0.142.

FINANCIAL.

MAINTENANCE.

RECEIPTS.

From Consumers:			
A.	Water rates, fixture	$36,631.00	
B.	Water rates, meter	7,721.71	
C.	Net receipts for water, (A) plus (B)	$44,352.71	
D.	Miscellaneous (rent, repairs, sales, etc)	788.71	
E.	Total from consumers		$45,141.42

From	Public Funds:		
F.	Hydrants	......	
G.	Fountains	$275.00	
H.	Street waterings	250.00	
I.	Public buildings	255.00	
J.	General appropriations	......	
	Total from public funds		$780.00
K.	Gross receipts from all sources		$45,921.42

EXPENDITURES.

AA.	Management and repairs	$16,507.14	
BB.	Interest on Bonds	608.00	
CC.	Total maintenance for year		$17,115.14
DD.	Transfer to Service Construction Account		462.16
DDD.	Balance transferred to Sinking Fund		28,344.12
K.	Total		$45,921.42

CONSTRUCTION (Service.)

RECEIPTS.

Q.	From balance of previous year	......	
R.	From bonds issued	......	
S.	From Appropriations from tax levy	......	
T.	Transferred from Maintenance Account	$462.16	
U.	From other sources	216.70	
V.	Total		$678.86

EXPENDITURES.

FF.	Extension of mains...........	......
GG.	Extension of services..........	$678.86
JJ.	Total construction for year....	$678.86
W.	Net cost of works to date......	604,131.15
X.	Bonded debt to date............	2,100.00
Y.	Value of Sinking Fund at date..	....
Z.	Average rate of interest, 4 per cent.	

CONSUMPTION.

1. Estimated total population at date, 14,400.
2. Estimated population on line of pipe, 14,300.
3. Estimated population supplied, 14,300.
4. Total consumption for the year, 543,807,350 gallons.
5. Passed through meters, 63,240,630.
6. Percentage of consumption metered, .116.
7. Average daily consumption, 1,489,883.
8. Gallons per day to each inhabitant, 103.46.
9. Gallons per day to each consumer, 104.18.
10. Gallons per day to each tap, 487.36.

DISTRIBUTION.

MAINS.

1. Kind of pipe, cement and cast iron.
2. Sizes, from 4-inch to 14-inch.
3. Extended during year.
4. Discontinued——feet during year.
5. Total now in use, 54.76 miles.
6. Cost of repairs per mile, $21.25.
7. Number of leaks per mile, 1.033.
8. Length of pipes less than 4 inches diam., 5.3 miles.
9. Number of hydrants added during year (public and private), 0.

10. Number of hydrants (public and private), now in use, 361.
11. Number of stop gates added during year, 5.
12. Number of stop gates now in use, 435.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow off gates, 17.
15. Range of pressure on mains at centre of city, 70 lbs. to 75 lbs.

SERVICES.

16. Kind of pipe, lead lined and cement lined.
17. Sizes, 1 inch.
18. Extended——feet.
19. Discontinued——feet.
20. Total now in use,——miles.
21. Number of service taps added during year, 36.
22. Number now in use, 3,057.
23. Average length of service,——feet.
24. Average cost of service for the year, $18.86.
25. Number of meters added, 1.
26. Number now in use, 66.
27. Percentage of service metered, .0215.
28. Percentage of receipts from metered water (B divided by K.), .168.
29. Number of motors and elevators added,——.
30. Number now in use, 9.

Respectfully submitted,

REDMOND E. WALSH,

Water registrar.

1906

MASS. STATE BOARD OF HEALTH,
ENGINEERING DEPARTMENT.

ANNUAL REPORT

OF THE

Water Departmen

OF THE

CITY OF WOBURN

FOR THE YEAR 1906

THE NEWS PRINT, WOBURN
1907

R E Walsh
Water Registrar

REPORT OF
WATER DEPARTMENT.

REPORT OF SUPERINTENDENT OF WATER WORKS.

WOBURN, MASS., December 31, 1906.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to submit the following report upon the condition of the works and the operations of the department for the year ending December 31, 1906.

During the past year the City Council made special appropriations for the construction of new mains upon the following streets: New Boston, North Main, Pearl, and Lexington streets.

On the extension of the Lexington street main, ledge was encountered for a distance of 1,000 feet requiring a large amount of blasting, which in connection with the frost, delayed the completion of the work. The total number of feet laid on this line, December 31, was 3,934.

The extension of the Pearl street main now affords ample protection in case of fire for the manufacturing establishments situated in that locality. There were 980 feet laid in this street.

On the construction of the New Boston street main, 2,500 feet were laid and the construction of the North Main street main required the laying of 2,500 feet.

The total number of feet laid to December 31, 1906, is 299,415 feet, or 56 miles and 3,735 feet.

There were fifty-four new services laid. A number of these connections were made with buildings situated on the lines of the new mains. Repairs were required upon 227 services, of these 14 were leaks, 35 required cleaning, 20 were renewed, 97 were shut off for repairs and general repairs were made upon 61.

The number of new service boxes set were 43, 11 were excavated and reset, 37 raised, to conform to grade, and 16 were lowered.

Eight new gates have been added to our system. Eleven new gate-boxes have been set, six reset, two lowered, three raised and three new gate-box heads set. The number of gates now in use is 439.

As in past years the greatest number of breaks in the mains resulted from the effects of lightning. The usual difficulty was experienced in repairing our breaks in the mains and the weakness of our present line of pipe was evidenced in many localities by the number of breaks in the same line of pipe.

We have had 45 breaks during the year. There were 25 on 4 inch pipe, 16 on 6 inch, 1 on 8 inch, and 3 on 10 inch. Of the above, 17 were caused by lightning, 11 by thin lining, 4 by rust, 8 by closing of hydrants and 5 were joint leaks. In connection with the construction of the main on New Boston street, five new hydrants were set, on the North Main street main four new hydrants were located.

The usual attention has been paid to the care of our hydrants throughout the City. It was necessary to replace 6 hydrants and to raise 4, and to set 2 new ones in place of 2 that had outlived their usefulness. The majority of hydrants now in use are the so-called Boston Post, and circumstances warrant they should be replaced with a new type of modern construction.

A source of inconvenience to consumers, when repairs are being made on hydrants, is the shutting off of a section of the main. In order to obviate this difficulty, I would suggest that when placing a hydrant, a gate should be set on the branch.

There are now 64 meters in use. During the year 12 have been replaced and set, and 14 have been tested.

RESERVOIR.

The condition of the reservoir remains unchanged from the previous year, no repairs having been made to the same. In view of these facts, I renew my recommendations of past years that the bottom and side walls be concreted. This would necessitate the blasting of the bottom and the cutting off of a portion of the back. This improvement would facilitate the cleaning and at the same time prevent unnecessary waste which under present conditions is considerable. The quality of the water has been at its high standard during the year. The average depth during the year was 16 3-10 feet.

PUMPING STATION AND GROUNDS.

The plant is in good condition. The grounds about the station have been carefully attended to during the year.

WATER SUPPLY.

I would like to call your attention to the inadequate means of supplying water in the wells. The sediment held in suspension by the water is deposited in the filter gallery, resulting in a serious lowering of the water at the wells.

I would recommend that immediate action be taken to remedy this defect.

SHOPS.

The present shop on Winn street is inadequate to meet the needs of the department. No room being available for storage purposes, it is necessary to hire a vacant shop situated on Winn street.

I would recommend that a suitable piece of land be secured and that the City erect a building for the Water Department.

The shop and barn on Cove street are very badly in need of repairs. The estimated cost of necessary repairs to put these buildings in proper condition is $300.

RECOMMENDATIONS.

Under this heading I wish to call your attention to the following additions and improvements which should be made to our pipe system:

1. A section of about 1,000 feet of 4-inch cement lined pipe on Main street, opposite the Boston and Northern Street Railway Company car station, north to the Wilmington line. This line of pipe was struck by lightning nine years ago and in the above space we had 73 leaks. This pipe should be replaced by a 6-inch pipe from the car station to the Wilmington line.

2. The 4-inch pipe now in on Nichols and Poole streets should be replaced with a 6-inch, from Main street to connect with a 6-inch on Winter street.

3. The 4-inch on North Warren street and Harrison avenue should be replaced with a 6-inch, as this was weakened eight years ago by lightning.

4. Owing to being weakened by lightning the 4-inch on Munroe and Morse streets should be replaced with a 6-inch pipe.

5. Part of Garfield avenue and Carter street were also considerably damaged by lightning and should be replaced.

6. I would recommend that the 6-inch main in Lexington street be extended to the watering trough at the junction of Cambridge and Lexington streets, a distance of 6,200 feet. There should be five hydrants and two gates placed on this line. I recommend the laying of this main, not for revenue but as a benefit to our system on that side of the City.

At present the water on Cambridge street is dependent upon Bedford street main, and whenever a break occurs on Bedford street beyond South Bedford street this whole section has to be shut off.

When repairs are necessary it takes two men one-half day to notify water takers that the water will be shut off, and in the spring and summer when market gardeners are busy setting out small plants the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection.

By putting on this main we would have a good circulation of water and additional pressure for fire purposes.

7. I recommend that a new 6-inch main be laid in Abbott street.

8. I recommend that a 4-inch main be laid in Park street, from its junction with Centre to Franklin street, a distance of 700 feet, to replace a 1-inch temporary main.

9. The 1-inch temporary main laid in Broad street, from Wade avenue to Montvale avenue, a distance of 572 feet, should be replaced with a 6-inch main.

10. I recommend that a 6-inch main be laid in Thorn street, from Central to Washington street, a distance of 550 feet, with one hydrant.

There are six houses on this street which are all supplied with a 1-inch temporary main, and there is considerable trouble on account of this pipe freezing.

11. I recommend the laying of a 6-inch main in Harrison avenue, from North Warren street to the railroad bridge, a distance of 816 feet. At present when there is a leak on North Warren street it shuts off a considerable section, whereas by putting in the above main it would overcome this difficulty.

12. I recommend that a 6-inch main be laid in Auburn street, from a point opposite Jaquith's stable on High street, a distance of 200 feet, which would connect two dead ends.

13. I recommend that the 10-inch cement lined pipe on Montvale avenue, from Green street to a point beyond the railroad bridge, be taken up and replaced with a 10-inch cast iron main. This line of pipe has developed signs of weakness that, in my opinion, warrant its renewal with the above.

Respectfully submitted,

ROBERT T. SPENCER,
Superintendent.

REPORT OF WATER REGISTRAR FOR 1906.

WOBURN, MASS., December 31, 1906.

To the Commissioner of Water and Water Supply:

SIR:—I have the honor to submit the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1906.

REVENUE AND EXPENDITURES.

STREET MAINS CONSTRUCTION.

Revenue.

Appropriation		$10,000 00

Expenditures.

Pearl street	$941 32	
Main street	2,255 54	
New Boston street	2,646 56	
Lexington street (not completed)	6,866 92	
		$12,710 34
Overdrawn		$2,710 34

SERVICE CONSTRUCTION.

Revenue.

Received for labor and material	$562 78	
Transfer from Maintenance Account	769 21	
		$1,331 99

Expenditures.

Services		$1,331 99
Cost of Water Works to Dec. 31, 1905	$604,131 15	
Construction for year ending Dec. 31, 1906, less amount turned into City Treasury	13,479 55	
		$617,610 70

MAINTENANCE.

Revenue.

Rent of house	$120 00	
Sundry receipts	848 99	
		$968 99
Water Rate Collections:		
1903 Account—		
Domestic rates	$10 00	
Fines	25	
		$10 25
1904 Account—		
Domestic rates	$121 00	
Fines	2 25	
	$123 25	
Abatements	2 50	
		$120 75
1905 Account—		
Domestic rates	$680 51	
Fines	15 25	
Meter rates	184 61	
	$880 37	
Abatements	6 84	
		$873 53
1906 Account—		
Domestic rates	37,030 46	
Fines	107 75	
Seals	53 50	
Meter rates	8,274 21	
Fractional rates	636 67	
	$46,102 59	
Abatements	456 39	
		$45,646 20
Total Collections for 1906		$47,619 72

Expenditures.

Maintenance:		
Expressing	$10 91	
Insurance	149 75	
Miscellaneous	489 03	
Miscellaneous labor	807 89	
New gates	138 00	
New hydrants	280 00	
Repairs to drinking fountains	35 99	
Repairs to gates	28 29	
Repairs to hydrants	147 82	
Repairs to meters and meter pits	231 84	
Repairs to services	1,329 36	
Repairs to standpipes	63 01	
Repairs to street mains	1.083 81	
Repairs to wagons	56 85	
Salary (Supt.)	1,200 00	
Sharpening picks, bars, etc.	20 30	
Stable	497 93	
Supplies	709 42	
Telephones	62 65	
		$7,342 85
Pumping Station:		
Care of grounds	$44 22	
Expressing	5 95	
Fuel	4,442 70	
Lighting	33 50	
Oil, waste and packing	147 57	
Repairs to boilers	66 35	
Repairs to pumps	136 18	
Salaries	3,131 88	
Supplies, tools, etc.	260 66	
Teaming ashes	26 88	
Telephone	27 81	
		$8,323 70

Office:

Books, paper and stationery	$62 15	
Office supplies	10 82	
Salaries	921 80	
		$994 77
Total expenditures, 1906		$16,661 32
Interest on water debt		64 00
Transfer to service construction account....		769 21
Transfer to sinking fund		30,125 19
		$47,619 72

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1906 INCLUSIVE.

Year	No. S'rvic's	Receipts.	Expenditures			Surplus
			Maintenance	Interest	Total‖	
1872	......	....	....	6,165,76	6,165.76	‡6,175.76
1873	498	4,600.00	4,976.99	11,424.37	16,401.36	‡11,801.36
1874	734	16,755.30	9,457.28	20,329.50	29,786.79	‡13,041.49
1875	835	17,117.25	7,166.44	24,500.00	31,666.34	‡14,549.29
1876	992	19,886.96	8,603.84	24,500.00	33,103.84	‡13.216.98
1877	1,084	22,508.03	6,848.84	25,108.59	31,957.43	‡9,449.40
1878	1,208	23,975.08	7,393.30	25,125.00	32,518.30	‡8,543.22
1879	1,290	24,060.29	7,527.40	25,798.60	33,326.00	‡8,165.71
1880	1,361	25,793.61	10,336.61	26,441.00	37,777.61	‡10,984.00
1881	1,413	27,608.62	8,291.00	26,741.00	35,032.00	‡7,423.38
1882	1,487	27,447.84	9,877.59	26,041.00	36,918.59	‡9,470.75
1883	1,559	29,925.52	9,276.27	27,041.00	36,317.27	‡6,391.75
1884	1,627	30,010.77	7,691.76	27,041.00	34 732.76	‡4,721.99
1885	1,730	30,999.51	8,974.37	27,041.00	36,016.37	‡5,015.86
1886	1,844	32,654.27	10,292.99	27,397.13	37,690.12	‡5,085.85
1887	1,966	34,266.65	†13,326.90	27,073.50	40,400.40	‡6,133,75
1888	2,061	34,002.02	10,697.99	16,982.50	27,680.40	6,321.53
1889	2,154	36,534.03	11,134.84	26,035.56	37,170.49	‡646.37
1890	2,233	37,944.36	12,351.11	25,306.75	37,657.86	336.50
1891	2,302	37,756.57	13,049.45	24,577.75	37,627 20	129.37
1892	2,369	37,405.88	11,033.61	24,483.75	35,517.36	2,888.52
1893	2,464	41,106.00	15,980.64	17,692.58	33,673.22	7,432.78
1894	2,559	42,528.48	12,629.09	12,985.75	25,614.84	17,913.64
1895	2,628	44,828.39	13,241.98	11,271.75	24,513.73	20,313.66
1896	2,709	45,750.29	20,671.20	10,070.00	30,741.20	15,009.09
1897	2,773	47,634.56	19,407.23	8,936.00	28,343.23	19,291.33
1898	2,821	48,013.24	11,164.80	7,812.00	18,976.80	29,036.44
1899	2,869	48,096.26	10,748.75	6,626.08	18,374.75	30,721.41
1900	2,894	§44,201.44	13,450.68	5.725.38	19,176.06	25,025.38
1901	2,925	‖42,814.87	11,627.99	4.774.00	26,402 09	26,412.88
1902	2,962	‖42,857.58	13,251.55	3,676.00	16,927.55	25.930.03
1903	2,996	‖47,616 21	13,995.10	2,660.00	16 655.10	30,961.11
1904	3,021	¶‖46,742.19	16,916.60	1,652.00	18,568.50	28,173.59
1905	3,057	¶‖45,921.42	16,507.14	608.00	17,115.14	28,806.28
1906	3,111	¶‖47,619 72	16,661.32	64.00	16,725.32	30,894.40
		1,188,023.21	394,562.66	590,708.22	985,270.88	347,753.57

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* Ten months.
† In this amount is included $1,000 transferred to construction account.
‡ Deficiency.
§ Appropriation for hydrant service reduced from 5,050 to 1.730.
‖ No appropriation for hydrant service.
¶ Water rates on Schools amounting to $537.00 nor paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita: for domestic and other purposes

WATER PUMPED.				CONSUMPTION PER CAPITA.			
				Annually.		Daily.	
Year.	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons.	For all Purposes Gallons.	Domestic Purposes Gallons.	For all Purposes. Gallons
†1873-74..	99,522,564	....	99,522,564	*10,625.94	*10,625.94	70.47	70.47
1874-75..	228,114,068	13,946,060	242,060,128	28,841.35	25,298.92	65.31	69.31
1875-76..	253,070,098	13,573,566	266,643,664	25,718.55	27,026,78	70.46	74.04
1876-77..	225,350,577	18,775,415	244,125,992	32,285.46	24,142.20	61.05	66.14
1877-78..	162,523,918	24 843,325	187,367,243	15,649.94	18,070.90	42.87	49.51
1878-79..	202,212,585	30,414,959	237,627,544	19,535 80	22,295.69	53.52	61.08
1879-80..	226,167,598	41,671,685	267,839,283	20,691.39	34,502.72	56.68	67.13
1880-81..	239,085,793	30,460,765	269,546 558	21,550.90	24,296.60	59.04	66.56
1881-82..	250,489,800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882-83..	269,660,902	31,566,923	301,227,825	23,609.20	26,372.59	64.68	72.25
1883-84..	214,940,593	37,978,384	252,918,977	18,551.75	21,829 70	50.82	59.80
1884-85..	187,874,878	43,341,199	231,216,977	15,989.35	19,667.96	43 80	53.91
1885-86..	218,303,505	33,042,819	251,346,324	18,043.10	20,774 14	49 43	56.91
1886-87..	312,407,520	22,012,063	344,419,580	25,094.98	26,863.16	68.75	73.59
1887-88..	285,924,528	38,363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
†1888	193,639,657	41,854,103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889	219,416,786	36,125 854	253,542,590	16,686.95	19,282 27	45.71	52.82
1890	251,052,891	42,752,509	293,805,400	18,597.88	21,764 97	50.95	59.63
1891	241,450,716	39,370,734	280,821, 56	17,709 45	20,596.40	48.51	56.42
1892	248,856,570	43,719,280	292,575,850	18,072.37	21,247.33	49.51	58.21
1893	284,481 937	53,434 313	337 916,250	20,457.49	24 300 03	56.04	66.57
1894	313,450,904	57,566,396	361,017,300	22,322.38	25,709.82	61.15	70.43
1895	317,570,332	67,951,868	385,522,200	22,398.81	27,191.57	61.36	74.49
1896	324,880,999	50,586,401	375,467,400	22,786 01	26,333.80	62.45	72.14
1897	309,634,781	57,696,169	367,330,950	21,595.43	25,619.39	59.16	70.19
1898	314,896,516	48,127,334	363,023,850	21,839 00	25,176.76	59.83	68.97
1899	358,980,560	46,048,540	405,029,100	24,757.28	27,933 04	67.83	76.53
1900	374,863,730	42,572,170	417 435,900	26,298 84	29,285 52	72.05	80.23
1901	380,420,649	46,217,451	426,638,100	26,602.84	29,834 83	72.88	81.74
1902 ...	403,426,680	41,255,670	444,682,350	28,310.64	31,205.78	77.56	85.49
1903	433,632,792	69,364,458	502,997,250	30,537 52	35,422.34	83 66	97.04
1904	453,058,373	67,226,077	520,284,450	31,793 57	36,511.18	87.10	100.03
1905	480,566,720	63,240,630	543,807,350	33,372.61	37,764.4	91.42	103.46
1906	492,138,200	60,243,700	552,381,900	34,176 26	38,359 85	93.63	105.09

Five months. ‡ Ten months. * Five months.

STATEMENT OF EXPENSES BY MONTHS.

MONTHS.	MAINTENANCE.		PUMPING STATION		OFFICE.		TOTALS.	
	Pay Roll	Suppies	Pay Rolls	Supplies	Pay Rolls	Supplies	1906	1905
January	406.28	$214 67	$367.62	$699.97	$106.80	$3.00	$1,798.34	$875,91
February	211.76	153.52	180.74	267.61	51.90	......	865 53	1,893.57
March	435 23	105.28	334.82	258.53	86.50	......	1,220.36	903.14
April	296.86	189.84	273.78	882.58	69.20	21.40	1,733.66	965.88
May	265.89	262.36	237.20	282.58	69.20	1.89	1,119.12	2,604.84
June	297.65	304.85	339.00	1,108.93	86.50	.85	2,137.78	1,275.60
July	238 62	324.25	250.75	360.35	69 20	......	1,243.17	1.143.95
August	589.36	329.28	297.38	124.97	86.50	......	1,427.49	1.505.89
September	343.25	255.09	247.02	2.30	69.20	2.75	919.61	1,940 36
October	237.15	678.44	296.69	177.56	69.20	2.33	1,461.37	919.15
November	385.35	407.47	284.64	311.90	88.00	......	1,477.36	1,726.88
December	243.12	167.28	305.01	431.77	69.20	40.75	1,257.53	751 97
	$3,950.52	$3,392.33	$3,414.65	$4,909.05	$921.80	$72.97	$16,661.32	$16,507.14

The following is a statement of meters in use together with those on hand:

MAKE	5-8-inch	3-4-inch	1-inch	1½-inch	2-inch	4-inch	Total
Crown	..	4	6	1	6	..	17
Empire	..	1	1	1	..	..	3
Gem	..	..	..	..	..	2	2
Hersey	..	5	12	1	5	1	24
Indicator	..	..	..	..	1	..	1
Nash	..	..	1	..	..	..	1
Neptune	..	13	..	..	2	..	15
Thompson	..	6	2	2	1	..	11
Union	1	3	10	4	5	..	23
Worthington	..	..	7	1	8	..	16
Total	1	32	39	10	28	3	133

WATER SERVICE.

Whole number put in to December 31, 1905	3,057
Number added in 1906	54
Total	3,111
Total number abandoned	64
Vacant services	55

VACANCIES.

Shut off for non-payment	2
Turned on upon payment	2
Number remaining shut off for non-payment	2
Faucets locked	275
Faucets unlocked	277

NUMBER OF FIXTURES.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Total Jan. 1 1907	Total Jan 1 1906
Faucets	1,084	1,017	1,128	1,482	407	696	265	6,079	5,964
Bath Tubs	137	112	137	172	41	110	18	727	695
Water Closets	457	383	406	627	76	161	37	2,147	2,014
Hose Attachments	91	116	133	131	37	94	35	637	635
	1,769	1,628	1,804	2,412	561	1,061	355	9,570	9,308

STATEMENT OF INCOME FROM WATER RATES.

	1902	1903	1904	1905	1906
Domestic Service .	$35,956 90	$38,913 23	$36,892 63	$37,411 00	$38,191 91
Meter Service	5,929 31	7,958 45	8,937 67	7,721 71	8,458 82
Totals	$41,886 21	$46,871 68	$45,830 30	$45,132 71	$46,650 73

UNCOLLECTED WATER RATES.

Domestic rates, 1904	$53.16
Domestic rates, 1905	363.50
Domestic rates, 1906	1,333.41
Frational rates	54.52
Meter rates	274.02
	$2,078.61

WATER TAKERS.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals	
								Jan. 1 1906	Jan. 1 1907
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	2	1	1	..	..	..	6	5
Bakehouses	..	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	9	..	..	8	10
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwelliugs	430	482	481	489	226	387	339	2805	2834
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevators	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	2	..	1	2	1	7	7
Families	599	680	657	681	272	444	188	3489	3521
Foundries	..	1	..	..	1	..	..	2	2
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	3	..	1	7	7	12	30	31
Halls, Clubs, etc	5	1	10	14	1	1	..	32	32
Hose and Fountains	90	115	132	129	36	94	32	628	628
Hotels	1	1	1	..	1	..	..	3	4
Hydrants	47	63	47	58	40	81	35	362	371
Irrigation	1	..	5	1	5	5	13	30	32
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	17	4	4	2	13	1	45	43
Morors	1	..	2	4	..	..	..	7	7
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	..	3	..	2	3
Public Library	..	..	1	..	..	1	..	1	2
Public Park	..	..	..	..	..	1	..	1	1
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	13	7	10	4	..	..	..	34	32
School Houses	5	1	2	2	5	2	2	16	17
Stables	50	73	50	24	57	44	30	328	328
Stores, Shops and Offices	24	40	58	190	11	12	3	327	338
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	7	..	1	1	17	18

COAL CONSUMED AND DUTY OF PUMPING ENGINES.

1906	Number of Hours Pumping	Pounds of Coal Used Firing and Banking	Pounds of Coal Used Pumping.	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir	Average Height of water in Pond Above High Mark
January	339½	19.500	149,600	43,247,400	1,395,077 4	255.7	213.7	17.7	25.7
February	308	19,800	144,500	41,674.500	1,488,375	253.6	211	15	26
March	366½	18,600	152,200	46,128,600	1.488,019	270	212.8	16.8	27
April	324½	19,000	140,200	41,468 700	1,382,290	260.4	212.6	16.6	26.8
May	341	21,000	160,500	47,620,650	1,536.150	262	211	15	26
June...........	330	21,200	160,100	47,378,100	1,579,270	261	212.8	16.8	25.2
July	341	21,900	160,000	49,436,100	1,594,712.9	271.7	213	17	28 4
August	339¾	21,900	163.000	49,553,700	1,598.506.5	268	213	17	27
September	366	21,200	161,500	48,385,050	1,612,835	264.8	211.7	15.7	22.6
October	341	21,700	154.600	45,342,150	1,462,650	257	213.3	17 3	22
November ...	325	22,300	144,000	41,887.560	1,396,250	251.8	212	16	24.9
December.....	421	21,700	177,600	50,259,300	1,621,267.7	252	211.4	15.4	28.2
Total	4,143¼	249,800	1,867,800	552,381,900	1,513,375	260.9	212 3	16.3	25.8

Number of gallons pumped, 1905	543,807,350
Number of gallons pumped, 1906	552,381,900
Coal consumed, 1905	1,047 6-20 tons
Coal consumed, 1906	1,058 16-20 tons

SUMMARY OF STATISTICS.

FOR YEAR ENDING 1906.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

CITY OF WOBURN, MIDDLESEX COUNTY, STATE OF MASSACHUSETTS.

Population by Census of 1905, 14,400.
Date of Construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery, near Horn Pond.
Mode of supply, Pumping direct and to reservoir.

PUMPING.

1. Builders of Pumping Machinery, Worthington & Blake.
2. Description of Fuel used, (a) Kind, Bituminous Coal; (b) Brand of coal, Keystone; (c) Average price of coal per gross ton, delivered, $4.20; (d) Percentage of ash, 9; (e) Wood, price per cord, none used.
3. Coal consumed for the year, 2,116,000 lbs.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 552,381,900 gallons, without allowance for slip.
7. Average static head against which pumps work, 196.3 feet.
8. Average dynamic head against which pumps work, 212.3 feet.
9. Number of gallons pumped per pound of equivalent coal (5), 261.05.

10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (5). Equals 46,186,128.

    Cost of pumping, figured on pumping station expenses, viz., $8,323.70.

11. Per million gallons pumped, $15.08.
12. Per million gallons raised one foot (dynamic), $0.07.

    Cost of pumping, figured on total maintenance, viz., $16,661.32.

13. Per million gallons pumped, $30.183.
14. Per million gallons raised one foot (dynamic) $0.142.

FINANCIAL.

MAINTENANCE.

Receipts.

From Consumers:			
A.	Water rates, fixture	$37,411 91	
B.	Water rates, meter	8,458 82	
C.	Net receipts for water, (A) plus (B)	45,870 73	
D.	Miscellaneous (rent, repairs, sales, etc.)	968 99	
E.	Total from consumers		$46,839 72
From Public Funds:			
F.	Hydrants	......	
G.	Fountains	$275 00	
H.	Street waterings	250 00	
I.	Public buildings	255 00	
J.	General appropriations	......	....
	Total from Public Funds		$780 00
K.	Gross receipts from all sources		$47,619 72

Expenditures.

AA.	Management and repairs	$16,661 32	
BB.	Interest on Bonds	64 00	
CC.	Total maintenance for year		$16,725 32

DD.	Transfer to Service Construction Account	769 21
DDD.	Balance transferred to Sinking Fund	30,125 19
K.	Total	$47,619 72

CONSTRUCTION.

Receipts.

Q.	From balance of previous year	......	
R.	From bonds issued	$10,000 00	
S.	From Appropriations from tax levy	......	
T.	Transferred from Maintenance Account	769 21	
U.	From other sources	562 78	
V.	Total		$11,331 99

Expenditures.

FF.	Extensions of mains	$12,710 34
GG.	Extension of services	1,331 99
JJ.	Total construction for year	$14,042 33
W.	Net cost of works to date	$617,610 70
X.	Bonded debt to date	$10,500 00
Y.	Value of Sinking Fund at date	....
Z.	Average rate of interest, 4 per cent.	

CONSUMPTION.

1. Estimated total population at date, 14,400.
2. Estimated population on line of pipe, 14,300.
3. Estimated population supplied, 14,300.
4. Total consumption for the year, 552,381,900 gallons.
5. Passed through meters, 60,243,700.
6. Percentage of consumption metered, .108.
7. Average daily consumption, 1,513,375.
8. Gallons per day to each inhabitant, 105.09.

DISTRIBUTION.

MAINS.

1. Kind of pipe, cement and cast iron.
2. Sizes, from 4-inch to 14-inch.
3. Extended during the year, 9,914 feet.
4. Discontinued, —— feet during the year.
5. Total now in use, 56.63 miles.
6. Cost of repairs per mile, $19.79.
7. Number of leaks per mile, 0.82.
8. Length of pipes less than 4 inches diam., 5.3 miles.
9. Number of hydrants added during year (public and private), 9.
10. Number of hydrants (public and private) now in use, 370.
11. Number of stop gates added during the year, 8.
12. Number of stop gates now in use, 443.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow-off gates, 17.
15. Range of pressure on mains at centre of city, 70 lbs. to 75 lbs.

SERVICES.

16. Kind of pipe, lead lined and cement lined.
17. Sizes, 1-inch.
18. Extended, —— feet.
19. Discontinued, —— feet.
20. Total now in use, —— miles.
21. Number of service taps added during year, 54.
22. Number now in use, 3,111.
23. Average length of service, —— feet.
24. Average cost of service for the year, $24.66.
25. Number of meters added, 1.
26. Number now in use, 64.
27. Percentage of service metered, .0205.

28. Percentage of receipts from metered water (B divided by K), .177.

29. Number of motors and elevators added, ——.

30. Number now in use, 9.

Respectfully submitted,

REDMOND E. WALSH,
Water Registrar.

1907

MASS. STATE BOARD OF HEALTH,
ENGINEERING DEPARTMENT.

1907

ANNUAL REPORT

OF THE

WATER DEPARTMENT

OF THE

CITY OF WOBURN

FOR THE YEAR 1907

THE NEWS PRINT, WOBURN, MASS.
1908

R [illegible]
Water Registrar

REPORT OF WATER DEPARTMENT

REPORT OF SUPERINTENDENT OF WATER DEPARTMENT FOR 1907.

WOBURN, MASS., December 31, 1907.

To the Commissioner of Water and Water Supply:

SIR: — I have the honor to submit the following report upon the condition of the work and operations of the department for the year ending December 31, 1907:

During the year the extension of the Lexington street main, commenced in 1906, was completed. This work required the laying of 1,205 feet of 6-inch cast iron pipe.

A two-inch temporary main was constructed a distance of 273 feet on Sheridan street.

The total number of feet laid to December 31, 1907, was 301,110 feet, or 57 miles and 150 feet.

There were forty new services laid. Repairs were necessary upon 323 services. Of these 67 required cleaning, 26 were renewed, 107 were shut off for repairs, and general repairs were made on 121.

The number of new service boxes set were 90, 13 were excavated and reset, 53 raised to conform to grade, and 79 were lowered.

One new gate has been added to our system. Ten new gate-boxes have been set, eleven reset, two lowered, four raised and two new gate-box heads set. The number of gates now in use is 440.

We have had 44 breaks in mains during the year. There were 14 on 6-inch pipe, 10 on 10-inch, 15 on 4-inch, two on 14-inch and three on 2½-inch. Of the above one was a joint leak, five were caused by rust, two by closing of hydrants, twenty-nine by thin lining, and seven were caused by concussion in blasting of ledge on Montvale avenue.

Three new hydrants have been added during the year. Two were located on Lexington street on the line of the new main and one on the line of the Sheridan street temporary main. It was necessary to replace eight hydrants, raise two and set two new ones in place of two that had outlived their usefulness. A source of inconvenience to consumers when repairs are being made on hydrants is the shutting off of a section of the main. In order to obviate this difficulty, I would suggest that when placing a hydrant, a gate should be set on the branch.

There are now 62 meters in use. During the year 13 have been replaced and set.

RESERVOIR.

There have been no improvements made to the reservoir during the year. I renew my recommendations of past years that the bottom and side walls be concreted. This would require the blasting of the bottom and the cutting off of a portion of the back.

This improvement would facilitate the cleaning and at the same time prevent unnecessary waste, which under present conditions is considerable. The quality of the water has been at its high standard during the year. The average depth was 14.4 feet.

PUMPING STATION AND GROUNDS.

The plant is in good condition. The grounds about the station have received their usual attention.

WATER SUPPLY.

During the past year tests have been made with a view of increasing our water supply, by driving wells on the westerly side of the pond. An excellent quality of water has been found.

I would recommend that immediate action be taken to supply this water to the filter gallery.

This improvement would give an ample supply of water.

SHOPS.

The present shop on Winn street is inadequate to meet the needs of the department. No room being available for storage purposes it is necessary to rent a vacant shop on Winn street.

I would recommend that a suitable piece of land be secured and that the city erect a building for the Water Department.

The shop and barn on Cove street are in need of repairs, the estimated cost of these improvements being $300.00.

RECOMMENDATIONS.

Under this heading I wish to call your attention to the following additions and improvements which should be made to our pipe system:

1. A section of about 1,000 feet of 4-inch cement lined pipe on Main street opposite the Boston and Northern Street Railway Company car station, north to the Wilmington line. This line of pipe was struck by lightning ten years ago and in the above space we had seventy-three leaks.

This pipe should be replaced by a 6-inch pipe from the car station to the Wilmington line.

2. The 4-inch pipe now in on Nichols and Poole streets should be replaced with a 6 inch, from Main street to connect with a 6-inch on Winter street.

3. The 4-inch on North Warren street and Harrison avenue should be replaced with a 6-inch, as this was weakened nine years ago by lightning.

4. Owing to being weakened by lightning the 4-inch on Munroe and Morse streets should be replaced with a 6-inch pipe.

5. Part ofGarfield avenue and Carter street were also considerably damaged by lightning and should be replaced.

6. I would recommend that the 6-inch main in Lexington street be extended to the watering trough at the junction of Cambridge and Lexington streets, a distance of 6,200 feet. There should be five hydrants and two gates placed on this line. I recommend the laying of this main, not for revenue but as a benefit to our system on that side of the city.

At present the water on Cambridge street is dependent upon the Bedford street main, and whenever a break occurs on Bedford street beyond South Bedford street this whole section has to be shut off. When repairs are necessary it takes two men one-half day to notify water takers that the water will be shut off, and in the spring and summer when market gardeners are busy setting out small plants the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection. By putting on this main we would have a good circulation of water and additional pressure for fire purposes.

7. I recommend that a new 6-inch main be laid in Federal street.

8. I recommend that a 6-inch main be laid in Park street from its junction with Centre to Franklin street, a distance of 700 feet, to replace a 1-inch temporary main.

9. The 1-inch temporary main in Broad street from Wade avenue to Montvale avenue, a distance of 572 feet, should be replaced with a 6-inch main and connect two dead ends.

10. I recommend that a 6-inch main be laid in Thorn street, from Central to Washington street, a distance of 500 feet, with one hydrant. There are six houses on this street which are all supplied with a 1-inch temporary main and there is considerable trouble on account of this pipe freezing.

11. I recommend the laying of a 6-inch main in Harrison avenue, from North Warren street to the railroad bridge, a distance of 816 feet. At present when there is a leak on North Warren street it shuts off a considerable section, whereas by putting in the above main it would overcome this difficulty.

12. A 6-inch main should be laid in Auburn street from a point opposite Jaquith's stable on High street, a distance of 200 feet, which would connect two dead ends.

13. I recommend that the 10-inch cement lined pipe on Montvale avenue from Green street to a point beyond the railroad bridge, be taken up and replaced with a 10-inch cast iron main. This line of pipe has developed signs of weakness that, in my opinion, warrants its renewal with the above.

14. The 4-inch cement main in New Boston street, from Clinton to Plain streets, should be replaced with a 6-inch cast iron main to connect with the new 6-inch cast iron main laid in 1906. This main was weakened by lightning and has given considerable trouble during the past few years.

15. I recommend the laying of a 6-inch cast iron main in Winn street, from its junction with Middlesex street, a distance of 600 feet, and connect two dead ends. There is considerable complaint from water takers in this section on account of the dirty water.

16. The 1¼-inch temporary main in Felton street should be replaced with a 6-inch cast iron main. This improvement would give the residents of that street an ample supply of water.

There should be two hydrants installed on this main in order to afford proper fire protection.

Respectfully submitted,

R. T. SPENCER,
Superintendent.

REPORT OF WATER REGISTRAR FOR 1907.

WOBURN, MASS., December 31, 1907.

To the Commissioner of Water and Water Supply:

SIR: — I have the honor to submit the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1907.

REVENUE AND EXPENDITURES.

NEW PUMP.

Appropriation	$30,000 00	
Expended	123 32	
		$29,876 68

STREET MAINS CONSTRUCTION.

Overdraft, 1906	$2,710 34	
* Completion Lexington street main	951 36	
Overdrawn	$3,661 70	

SERVICE CONSTRUCTION.

REVENUE.

Received for labor and material	$394 18	
Transfer from maintenance acc't	763 78	
		$1,157 96

EXPENDITURES.

New services		$1,157 96
Cost of Water Works to December 31, 1906	$617,610 70	
Construction for year ending December 31, 1907, less amount turned into city treasury .	1,715 14	
		$619,325 84

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* Total cost Lexington street main, $7,818.28.

MAINTENANCE.

REVENUE.

Rent of house	$70 00	
Sale of horse	75 00	
Sundry receipts	1,256 87	
		$1,401 87
Water Rate Collections:		
1904 Account —		
Domestic rates	$48 66	
Fines	1 00	
		$49 66
1905 Account —		
Domestic rates	$187 00	
Fines	1 50	
Meter rates	69 32	
	$257 82	
Abatements	3 50	
		$254 32
1906 Account —		
Domestic rates	$845 31	
Fines	15 50	
Meter rates	87 21	
	$948 02	
Abatement	5 34	
		$942 68
1907 Account —		
Domestic rates	$39,200 00	
Fines	77 00	
Seals	32 00	
Frational rates	525 73	
Meter rates	10,298 41	
Amounts carried forward	$50,133 14	$2,648 53

Amounts brought forward		$50,133 14	$2,648 53
1907 Account —			
Abatements	$332 52		
Discount	4,333 70		
		4,666 22	
			45,466 92
Total collections for 1907			$48,115 45

EXPENDITURES.

Maintenance:		
Expressing	$10 65	
Miscellaneous	622 15	
Miscellaneous labor	868 10	
New horse	250 00	
New hydrants	219 00	
New meters	235 20	
Repairs to drinking fountains	79 13	
Repairs to gates	32 03	
Repairs to hydrants	147 25	
Repairs to meters and meter pits	146 91	
Repairs to services	1,664 30	
Repairs to standpipes	67 88	
Repairs to street mains	911 37	
Repairs to wagons	74 30	
Salary (superintendent)	1,200 00	
Sharpening picks, bars, etc.	34 08	
Stable	550 26	
Supplies	518 72	
Telephones	83 44	
Amount carried forward		$7,714 77

Amount brought forward		$7,714 77
Pumping Station:		
Care of grounds	$48 00	
Expressing	11 22	
Fuel	5,843 47	
Lighting	97 68	
New valves, etc.	99 25	
Oil, waste and packing	221 92	
Repairs to boilers	14 97	
Repairs to pumps	293 11	
Salaries	3,695 41	
Supplies, tools, etc.	255 07	
Telephone	32 82	
		10,612 92
Office:		
Office supplies, etc.	$28 35	
Salaries	909 00	
		937 35
Total expenditures for year		$19,265 04
Interest on water debt		410 00
Transfer to Service Construction account		763 78
Transfer to Sinking Fund		27,676 63
		$48,115 45

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1907, INCLUSIVE.

Year	No. S'rvic's	Receipts	Expenditures			Surplus
			Maintenance	Interest	Total	
1872	......	....	....	$6,165 76	$6,165 76	‡$6,175 76
1873	498	$4,600 00	$4,976 99	11,424 37	16,401 36	‡11,801 36
1874	734	16,755 30	9,457 28	20,329 50	29,786 79	‡13,041 49
1875	835	17,117 25	7,166 44	24,500 00	31,666 34	‡14,549 29
1876	992	19,886 96	8,603 84	24,500 00	33,103 84	‡13,216 98
1877	1,084	22,508 03	6,848 84	25,108 59	31,957 43	‡9,449 40
1878	1,208	23,975 08	7,393 30	25,125 00	32,518 30	‡8,543 22
1879	1,290	24,060 29	7,527 40	25,798 60	33,326 00	‡8,165 71
1880	1,361	25,793 61	10,336 61	26,441 00	37,777 61	‡10,984 00
1881	1,413	27,608 62	8,291 00	26,741 00	35,032 00	‡7,423 38
1882	1,487	27,447 84	9,877 59	26,041 00	36,918 59	‡9,470 75
1883	1,559	29,925 52	9,276 27	27,041 00	36,317 27	‡6,391 75
1884	1,627	30,010 77	7,691 76	27,041 00	34,732 76	‡4,721 99
1885	1,730	30,999 51	8,974 37	27,041 00	36,016 37	‡5,015 86
1886	1,844	32,654 27	10,292 99	27,397 13	37 690 12	‡5,085 85
1887	1,966	34,266 65	†13,326 90	27,073 50	40,400 40	‡6,133 75
1888	2,061	34,002 02	10,697 99	16,982 50	27,680 40	6,321 53
1889	2,154	36,534 03	11,134 84	26,035 56	37,170 49	‡646 37
1890	2,233	37,944 36	12,351 11	25,306 75	37,657 86	336 50
1891	2,302	37,756 57	13,049 45	24,577 75	37,627 20	129 37
1892	2,369	37,405 88	11,033 61	24,483 75	35,517 36	2,888 52
1893	2,464	41,106 00	15,980 64	17,692 58	33,673 22	7,432 78
1894	2,559	42,528 48	12,629 09	12,985 75	25,614 84	17,913 64
1895	2,628	44,828 39	13,241 98	11,271 75	24,513 73	20,313 66
1896	2,709	45,750 29	20,671. 20	10,070 00	30,741 20	15,009 09
1897	2,773	47,634 56	19,407 23	8,936 00	28,343 23	19,291 33
1898	2,821	48,013 24	11,164 80	7,812 00	18,976 80	29,036 44
1899	2,869	48,096 26	10,748 75	6,626 08	18,374 75	30,721 41
1900	2,894	§44,201 44	13,450 68	5,725 38	19,176 06	25,025 38
1901	2,925	‖42,814 87	11,627 99	4,774 00	26,402 09	26,412 88
1902	2,962	‖42,857 58	13,251 55	3,676 00	16,927 55	25,930 03
1903	2,996	‖47,616 21	13,995 10	2,660 00	16,655 10	30,961 11
1904	3,021	¶‖46,742 19	16,916 60	1,652 00	18,568 50	28,173 59
1905	3,057	¶‖45,921 42	16,507 14	608 00	17,115 14	28,806 28
1906	3,111	¶‖47,619 72	16,661 32	64 00	16,725 32	30,894 40
1907	3,151	¶‖48,115 45	19,265 04	410 00	19,675 04	28,440 41
		$1,236,138 66	$413,827 70	$591,118 22	$1,004,945 92	$376,193 98

* Ten months.

† In this amount is included $1,000 transferred to Construction account.

‡ Deficiency.

§ Appropriation for hydrant service reduced from $5,050 to $1,730.

‖ No appropriation for hydrant service.

¶ Water rates on schools amounting to $537 not paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita: for domestic and other purposes.

WATER PUMPED				CONSUMPTION PER CAPITA			
				Annually		Daily	
Year	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons	For all Purposes Gallons	Domestic Purposes Gallons	For all Purposes Gallons
†1873-74...	99,522,564	....	99,522,564	*10,625.94	*10,625.94	70.47	70.47
1874-75...	228,114,068	13,946,060	242,060,128	28,841.35	25,298.92	65.31	69.31
1875-76...	253,070,098	13,573,566	266,643,664	25,718.55	27,026.78	70.46	74.04
1876-77...	225,350,577	18,775,415	244,125,992	32,285.46	24,142.20	61.05	66.14
1877-78...	162,523,918	24,843,325	187,367,243	15,649.94	18,070.90	42.87	49.51
1878-79...	202,212,585	30,414,959	237,627,544	19,535.80	22,295.69	53.52	61.08
1879-80...	226,167,598	41,671,685	267,839,283	20,691.39	34,502.72	56.68	67.13
1880-81...	239,085,793	30,460,765	269,546,558	21,550.90	24,296.60	59.04	66.56
1881-82...	250,489,800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882-83 ..	269,660,902	31,566,923	301,227,825	23,609.20	26,372.59	54.68	72.25
1883-84...	214,940,593	37,978,384	252,918,977	18,551.75	21,829.70	50.82	59.80
1884-85...	187,874,878	43,341,199	231,216,977	15,989.35	19,667.96	43.80	53.91
1885-86...	218,303,505	33,042,819	251,346,324	18,043.10	20,774.14	49.43	56.91
1886-87...	312,407,520	22,012,063	344,419,580	25,094.98	26,863.16	68.75	73.59
1887-88...	285,924,528	38,363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
†1888......	193,639,657	41,854,103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889......	219,416,786	36,125,854	253,542,590	16,686.95	19,282.27	45.71	52.82
1890......	251,052,891	42,752,509	293,805,400	18,597.88	21,764.97	50.95	59.63
1891......	241,450,716	39,370,734	280,821,050	17,709.45	20,596.40	48.51	56.42
1892......	248,856,570	43,719,280	292,575,850	18,072.37	21,247.33	49.51	58.21
1893......	284,481,937	53,434,313	337,916,250	20,457.49	24,300.03	56.04	66.57
1894......	313,450,904	57,566,396	361,017,300	22,322.38	25,709.82	61.15	70.43
1895......	317,570,332	67,951,868	385,522,200	22,398.81	27,191.57	61.36	74.49
1896......	324,880,999	50,586,401	375,467,400	22,786.01	26,383.80	62.45	72.14
1897......	309,634,781	57,696,169	367,330,950	21,595.43	25,619.39	59.16	70.19
1898......	314,896,516	48,127,334	363,023,850	21,839.00	25,176.76	59.83	68.97
1899......	358,980,560	46,048,540	405,029,100	24,757.28	27,933.04	67.83	76.53
1900......	374,863,730	42,572,170	417,435,900	26,298.84	29,285.52	72.05	80.23
1901......	380,420,649	46,217,461	426,638,100	26,602.84	29,834.83	72.88	81.74
1902......	403,426,680	41,255,670	444,682,350	28,310.64	31,205.78	77.56	85.49
1903......	433,632,792	69,364,458	502,997,250	30,537.52	35,422.34	83.66	97.04
1904......	453,058,373	67,226,077	520,284,450	31,793.57	36,511.18	87.10	100.03
1905......	480,566,720	63,240,630	543,807,350	33,372.61	37,764.40	91.42	103.46
1906......	492,138,200	60,243,700	552,381,900	34,176.26	38,359.85	93.63	105.09
1907......	535,950,900	77,840,250	613,791,150	37,218.81	42,624.38	101.96	116.77

† Five months. ‡ Ten months. * Five months.

See page 316 for slip.

STATEMENT OF EXPENSES BY MONTHS.

MONTHS	MAINTENANCE		PUMPING STATION		OFFICE		TOTALS	
	Pay Rolls	Supplies	Pay Rolls	Supplies	Pay Rolls	Supplies	1907	1906
January	$333 86	$185 87	$244 12	$667 57	$69 20	$0 65	$1,501 27	$1,798 34
February	311 15	151 49	305 88	23 95	69 20	2 70	864 37	865 53
March	404 08	159 00	387 53	513 73	88 00	4 25	1,556 59	1,220 39
April	258 87	147 10	280 25	644 11	70 70	....	1,401 03	1,733 66
May	313 10	448 40	248 53	575 28	69 20	1 60	1,656 11	1,119 12
June	306 13	167 35	242 09	152 28	69 95	14 15	951 95	2,137 78
July	368 37	156 09	413 23	489 63	86 50	....	1,513 82	1,243 17
August	419 28	339 66	440 20	627 21	88 00	....	1,914 35	1,427 49
September	384 03	421 60	385 81	566 82	69 20	....	1,827 46	919 61
October	285 74	579 48	302 34	1,019 58	70 70	3 50	2,261 34	1,461 37
November	618 39	489 82	377 20	664 56	86 50	1 50	2,237 97	1,477 36
December	340 40	125 51	361 34	679 68	71 85	....	1,578 78	1,257 53
	$4,343 40	$3,371 37	$3,988 52	$6,624 40	$909 00	$28 35	$19,265 04	$16,661 32

The following is a statement of meters in use together with those on hand:

MAKE	5-8-inch	3-4-inch	1-inch	1¼-inch	2-inch	4-inch	Total
Crown	..	4	6	1	6	..	17
Empire	..	1	1	1	..	..	3
Gem	..	..	..	..	..	2	2
Hersey	..	5	12	1	5	1	24
Indicator	..	..	..	..	1	..	1
Nash	..	..	1	..	..	..	1
Neptune	..	13	..	..	2	..	15
Thompson	..	6	2	2	1	..	11
Union	2	3	11	4	5	1	26
Worthington	..	..	7	1	8	..	16
Total	2	32	40	10	28	4	116

WATER SERVICE.

Whole number put in to December 31, 1906	3,111
Number added in 1907	40
Total	3,151
Total number abandoned	64
Vacant services	55

VACANCIES.

Shut off for non-payment	0
Turned on upon payment	0
Number remaining shut off for non-payment	2
Faucets locked	217
Faucets unlocked	225

NUMBER OF FIXTURES.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Total Jan. 1, 1908	Total Jan. 1, 1907
Faucets..........	1,096	1,036	1,145	1,495	422	721	281	6,196	6,079
Bath Tubs........	144	118	142	176	44	117	22	763	727
Water Closets....	488	394	424	640	83	89	44	2,162	2,147
Hose Attachments	91	116	133	131	37	94	35	637	637
	1,819	1,664	1,844	2,442	586	1,021	382	9,758	9,590

STATEMENT OF INCOME FROM WATER RATES.

	1903	1904	1905	1906	1907
Domestic Service	$39,211 14	$37,426 53	$37,921 78	$38,657 64	$40,933 70
Meter Service...	7,958 45	8,937 67	7,721 71	8,458 82	10,454 94
	$47,169 59	$46,364 20	$45,643 40	$47,116 46	$51,388 64
Abatements and Discount.....	547 91	533 90	510 78	465 73	4,675 06
Totals......	$46,621 68	$45,830 30	$45,132 71	$46,650 73	$46,713 58

UNCOLLECTED WATER RATES.

Domestic rates, 1904	$12 50
Domestic rates, 1905	131 25
Domestic rates, 1906	575 75
Domestic rates, 1907	1,463 90
Fractional rates	46 00
Meter rates	418 20
	$2,647 60

WATER TAKERS.

CLASSIFICATION	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	TOTALS	
								Jan. 1, 1908	Jan. 1, 1907
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	2	1	1	..	..	..	6	5
Bakehouses	..	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	11	..	..	12	10
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	431	484	481	493	232	396	193	2,710	2,681
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevators	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	2	..	1	2	1	7	7
Families	600	682	657	685	278	455	344	3,701	2,672
Foundries	..	1	..	..	1	..	..	2	2
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	3	..	1	7	8	13	33	31
Halls, Clubs, etc	5	1	10	14	1	1	..	32	32
Hose and Fountains	90	115	132	129	36	94	32	628	628
Hotels	1	1	1	..	..	..	..	3	4
Hydrants	47	63	47	58	40	81	35	373	371
Irrigation	1	..	5	1	5	5	13	32	32
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	17	4	5	2	13	3	47	45
Motors	2	..	2	4	..	..	..	8	7
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	..	3	..	2	3
Public Library	..	..	1	..	..	1	..	1	2
Public Park	..	..	..	..	..	1	..	1	1
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	13	7	10	5	..	..	..	35	34
School Houses	5	1	2	3	5	2	2	20	19
Stables	50	74	50	24	57	44	31	330	328
Stores, Shops and Offices	24	40	58	190	11	12	3	338	338
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	7	..	1	1	18	18

COAL CONSUMED AND DUTY OF PUMPING ENGINES.

1907	Number of Hours Pumping	Pounds of Coal used Firing and Banking	Pounds of Coal used Pumping	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir	Average Height of Water in Pond above High Mark
January	380	22,100	178,100	49,377,300	1,592,816	252.9	215.6	16.6	27.3
February....	461¼	18,200	166,400	47,885,250	1,710,187.5	259	211.9	12.9	26.5
March.......	489	15,000	179,400	51,383,850	1,657,543.5	264	213	14	29
April	342	21,000	163,900	47,730,900	1,591,030	258	213.9	14.9	27.3
May.........	341	21,900	165,600	49,311,150	1,590,682	263	212.9	13.9	27
June........	376	21,000	173,400	52,640,700	1,754,690	270.7	212.7	13.7	27
July.........	492	21,900	205,200	58,586,850	1,889,898	257.9	210.6	11.6	26.2
August......	655	8,400	217,600	60,174,450	1,941,111	266	209.5	10.5	20.6
September..	708	....	201,600	54,492,900	1,816,430	270	212.4	13.4	17.5
October.....	371½	21,400	177,300	48,061,650	1,550,375.8	241.8	214.5	15.5	26.4
November ..	497½	12,600	188,800	49,458,150	1,648,605	245	217	18	20
December ..	677	3,500	172,600	44,688,000	1,441,548	253.7	216.9	17.9	21
Total	5,790¼	187,000	2,184,900	613,791,150	1,681,619.5	258.7	213.4	14.4	24.6

Number of gallons pumped, 1906 . .	552,381,900
Number of gallons pumped, 1907 . .	613,791,150
Coal consumed, 1906	1,058 16-20 tons
Coal consumed, 1907	1,185 19-20 tons

SUMMARY OF STATISTICS.

For Year Ending 1907.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

City of Woburn, Middlesex County, State of Massachusetts.

Population by Census of 1905, 14,400.
Date of construction, 1872–73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery near Horn Pond.
Mode of supply, pumping direct and to reservoir.

Pumping.

1. Builders of pumping machinery, Worthington & Blake.
2. Description of fuel used, (a) kind, bituminous coal; (b) brand of coal; (c) average price of coal per gross ton, delivered, $4.92; (d) percentage of ash, 9; (e) wood, price per cord, none used.
3. Coal consumed for the year, 2,371,900 pounds.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 613,791,150 gallons, without allowance for slip, which a recent test shows to be 17 per cent.
7. Average static head against which pumps work, 196.3 feet.
8. Average dynamic head against which pumps work, 212.3 feet.

9. Number of gallons pumped per pound of equivalent coal (3), 258.73.

10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (3). Equals 45,818,439.

Cost of pumping, figured on pumping station expenses, viz., $10,612.92.

11. Per million gallons pumped, $17.28.

12. Per million gallons raised one foot (dynamic), $0.081.

Cost of pumping, figured on total maintenance, viz., $19,265.04.

13. Per million gallons pumped, $31.376.

14. Per million gallons raised one foot (dynamic), $0.147.

FINANCIAL.

MAINTENANCE.

RECEIPTS.

From Consumers:		
A. Water rates, fixture .	$40,153 70	
B. Water rates, meter .	10,454 94	
C. Net receipts for water, (A) plus (B) . . .	$50,608 64	
D. Miscellaneous (rent, repairs, sales, etc.) . .	1,401 87	
	$52,010 51	
D2. Discount and abatements	4,675 06	
E. Total from consumers .		$47,335 45
From Public Funds:		
F. Hydrants		
G. Fountains . . .	$275 00	
H. Street waterings . .	250 00	
Amount carried forward . .	$525 00	

	Amounts brought forward .	$525 00	$47,335 45
I.	Public buildings . .	255 00	
J.	General appropriations .		
	Total from Public Funds		780 00
K.	Gross receipts from all sources . . .		$48,115 45

EXPENDITURES.

AA.	Management and repairs .	$19,265 04	
BB.	Interest on bonds . .	410 00	
CC.	Total maintenance for year		$19,675 04
DD.	Transfer to Service Construction account . . .		763 78
DDD.	Balance transferred to Sinking Fund . .		27,676 63
K.	Total		$48,115 45

CONSTRUCTION.

RECEIPTS.

Q.	From balance of previous year		
R.	From bonds issued . .		
S.	From appropriations from tax levy . . .		
T.	Transferred from Maintenance account . .	$763 78	
U.	From other sources .	394 18	
V.	Total		$1,157 96

EXPENDITURES.

FF.	Extension of mains .	$951 36
GG.	Extension of services .	1,157 96
JJ.	Total construction for year	$2,109 32
W.	Net cost of works to date	$619,325 84
X.	Bonded debt to date .	$39,000 00
Y.	Value of Sinking Fund at date	

Z. Average rate of interest, .044 per cent.

CONSUMPTION.

1. Estimated total population at date, 14,400.
2. Estimated population on line of pipe, 14,300.
3. Estimated population supplied, 14,300.
4. Total consumption for the year, 613,791,150 gallons.
5. Passed through meters, 77,840,250.
6. Percentage of consumption metered, .126.
7. Average daily consumption, 1,681,619.5.
8. Gallons per day to each inhabitant, 116.77.

DISTRIBUTION.

MAINS.

1. Kind of pipe, cement and cast iron
2 Sizes, from 4-inch to 14-inch.
3. Extended during the year, 1,205 feet.
4. Discontinued, —— feet during the year.
5 Total now in use, 56.89 miles.
6 Cost of repairs per mile, $16.02.
7. Number of leaks per mile, 0.77.
8. Length of pipes less than 4 inches diam., 5.81 miles.
9 Number of hydrants added during year (public and private), 3.
10. Number of hydrants (public and private) now in use, 373.

11. Number of stop gates added during the year, 1.
12. Number of stop gates now in use, 444.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow-off gates, 17.
15. Range of pressure on mains at centre of city, 70 pounds to 75 pounds.

SERVICES.

16. Kind of pipe, lead lined, cement lined and galvanized.
17. Sizes, 1-inch.
18. Extended, —— feet.
19. Discontinued, —— feet.
20. Total now in use, —— miles.
21. Number of service taps added during year, 40.
22. Number now in use, 3,151.
23. Average length of service, —— feet.
24. Average cost of service for the year, $28.94.
25. Number of meters added, ——.
26. Number now in use, 62.
27. Percentage of service metered, .019.
28. Percentage of receipts from metered water (B divided by K), .217.
29. Number of motors and elevators added, 1.
30. Number now in use, 10.

Respectfully submitted,

REDMOND E. WALSH,
Water Registrar.

MASS. STATE BOARD OF HEALTH,
ENGINEERING DEPARTMENT.

1908

ANNUAL REPORT

OF THE

WATER DEPARTMENT

OF THE

CITY OF WOBURN

FOR THE YEAR 1908.

PRESS OF THE DAILY TIMES, WOBURN. MASS.
1909

[illegible]
State Registrar

REPORT OF WATER DEPARTMENT

REPORT OF SUPERINTENDENT OF WATER DEPARTMENT FOR 1908.

Woburn, Mass., December 31, 1908.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to submit the following report upon the condition of the work and operation of the department for the year ending December 31, 1908.

During the year the work of replacing the 4-inch cement main in New Boston Street with a 6-inch cast iron main was commenced. This work necessitated the laying of 4,888 feet of pipe. In addition five new gates were installed on this line, and six hydrants were replaced with ones of a more modern make. This section of our system had caused us considerable trouble since it was weakened by lightening seven years ago. The constantly securing breaks on this main was the cause of much inconvenience to water users, as during the time consumed in repairing them they were deprived of their water supply.

The 4-inch cement main in Richardson Street being in a deplorable condition it was necessary to replace it with a 6-inch cast iron main. There were 1,695 feet of pipe laid in this street.

A 2-inch temporary main was constructed a distance of 483 feet in Holden Place. Three families residing on this thoroughfare will benefit by this addition to our system. A 6-inch service was installed for fire protection at Kimball's factory on Main Street. The new main which was constructed in Mill Street required the laying of 1,733 feet of pipe. This main consists of 1,333 feet of 6-inch cast iron pipe, and 400 feet of 4-inch cast iron pipe. It was necessary to lay the 4-inch pipe on account of the weather conditions, and the difficulty in securing 6-inch pipe. Three hydrants were installed on this line, and one gate was added to the system. The total number of feet of mains laid to December 31, 1908, was 309,309 feet, or 58 miles and 3,069 feet. There were 37 new services laid. Repairs were made on 369. Of these 66 required cleaning, 35 were relaid, 127 were shut off for repairs, and general repairs were made on 141. The number of new service boxes set were 75, 34 were excavated and reset, 23 raised to conform to grade and 174 were lowered. Eight new gates have been added to our system, 13 new gate-boxes have been set, 21 replaced, 4 raised, 6 lowered, 14 packed, and 2 new gate-box heads set. The number of gates now in use is 446. We have had 71 breaks during the year. There were 3 on 14-inch pipe, 1 on 10-inch, 2 on 8-inch, 11 on 6-inch, and 54 on 4-inch. Of the above 2 were joint leaks, 2 were caused by rust, 9 by closing of hydrants, 40 by thin lining, 15 by lighting, and 3 by concussion caused by blasting of ledge. Four new hydrants have been added during the year. It was necessary to relocate 8, raise 4, and set 11 new ones in place of 11 that had outlived their usefulness. Minor repairs were made upon 18 hydrants. The number of hydrants now in use, 377.

Meters.

Thirteen meters have been added. The number now in use, 75. During the year 17 were replaced and set.

Reservoirs.

The reservoirs have been cleaned out once. I renew my recommendations of past years that the bottom and side-walks be concreted. This would require the blasting of the bottom and the cutting off of a portion of the back.

Pumping Station and Grounds.

The work commenced in 1907 for addition to pumping station and installing of a new pump was completed during the year. The new well was also completed. It was necessary to lay 223 feet of 18-inch pipe to connect the new pump with our mains, and 70 feet of 22-inch to connect the well with the pump. The grounds have received their usual attention.

Shops.

During the past year we have experienced many inconveniences for lack of room in our repair shop on Winn Street. This is due to the large amount of material that is necessary for the department to have in stock. At the present time we rent a shop for storage purposes. In view of these facts it is apparent that some provision will have to be made for securing more suitable quarters.

Inspection of Mains.

We have had a test for leaks in the mains and found considerable waste in various sections of the city. The chief cause of many of the breaks in our mains is lightening, coming in contact with the telephone and electric light wires which are grounded on our water pipes. Serious consideration should be given to this important matter and action should be taken to compel the companies to remedy this cause of so many breaks. We also find that many breaks are caused by electrolysis from bonded wires of the street railway company's rails which are directly over our mains in various sections of the city.

Recommendations.

Under this heading I desire to call your attention to the following list of streets where improvements are needed on our system.

Street	Size of pipe now in use	Size of pipe recommended
No. Main, 1,000 ft.	4 inch.	6 inch.
Nichols	4 inch.	6 inch.
Poole	4 inch.	6 inch.
No. Warren	4 inch.	6 inch.

Street	Size of pipe now in use	Size of pipe recommended
Harrison Ave.	4 inch.	6 inch.
Munroe	4 inch.	6 inch.
Morse	4 inch.	6 inch.
Garfield Ave.	4 inch.	8 inch.
Carter	4 inch.	6 inch.
Lexington, 6,200 ft.	None.	6 inch.
Federal	None.	6 inch.
Park	1 inch.	6 inch.
Thorn	1 inch.	6 inch.
Auburn, 200 ft.	4 inch.	6 inch.
Montvale Ave.	10 inch.	12 inch.
Winn, 600 ft.	6 inch.	6 inch.
Felton	1¼ inch.	6 inch.
Broad, 572 ft.	1 inch.	6 inch.

Of the above, my reasons for recommending Broad, Winn and Auburn streets is for the purpose of eliminating dead ends which should not exist on our system. I recommend the laying of the Lexington Street main as a benefit to our system on that side of the city. At present the water on Cambridge Street is dependent upon the Bedford Street main, and whenever a break occurs on Bedford Street beyond South Bedford Street this whole section has to be shut off. When repairs are necessary it takes two men one-half day to notify water takers that the water will be shut off, and in the spring and summer when market gardeners are busy setting out small plants the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection. By putting in this main we would have a good circulation of water and additional pressure for fire purposes.

Respectfully submitted,

ROBERT T. SPENCER,

Superintendent.

REPORT OF COMMISSIONER OF WATER AND WATER SUPPLY.

To the Honorable Board of Public Works, Woburn, Mass.:

Gentlemen:—In presenting this my first annual report I believe it may not be out of place to briefly review the history of the water works in so far as this history directly affects present and future conditions.

The works were constructed in 1873-74, including a pumping station, Worthington pump, reservoir and a distributing system of cement-lined pipe. The reservoir was merely excavated, not lined or covered. In 1882 a Blake pump was added and in 1896 two 125 H. P. boilers were installed. Since 1889 the tastes resulting at certain seasons from the exposure of the ground water in an uncovered reservoir have been referred to in many of the annual reports; and since 1881 the number of breaks occurring in the cement-lined mains has formed an important feature in each yearly statement. Despite this, however, a new fourteen-inch cement-lined main was laid in 1889. In the report of 1896 the advisability of purchasing a new pump is first referred to, and since then has constituted a matter of annual discussion.

The rapidly increasing consumption and the annual shortage in the dry season of each year made it plain in 1903 that an additional supply was necessary, and in this year Mr. Coffin, a well-known hydraulic engineer, recommended the development of an auxiliary supply near Sucker Brook. In various reports of the State Board of Health the fact had been proclaimed that despite the gradual improvement of Horn Pond as a result of removing the contaminating drainage, the water supply drawn from the gallery was depreciating.

All of these disabilities of the system—the depreciated pumping plant, the inadequate supply and the breaking and leaking pipe system—have from year to year grown more pronounced, but it was not until 1907 that the work of rejuvenation was commenced. In this year Mr. Frank A. Barbour was retained as engineer to supervise improvements. The work has involved investigation for an additional supply, the enlargement of the pumping station and the installation of a new pump, the construction of a larger and deeper well at the station, and tests of the pipe system for leakage.

In April, 1907, it was voted to purchase a new pump, and in August of that year a contract for a vertical, fly-wheel pump of 5,000,000 gallons daily capacity was awarded to the Platt Iron Works Company for the sum of $28,475.00. The guaranteed efficiency of this engine is such that the cost of fuel should be reduced to one-half that necessary with the old apparatus and a yearly saving in cost of coal of at least $3,000.00 effected. In the autumn of 1907 a contract for the enlargement of the pumping station was let to Bellamy & Company, which, except for such work as cannot be done until the installation of the pumping plant is completed, was finished in April, 1908.

The contract for the pump required that it should be ready for operation February 15, 1908. Owing to circumstances for which the city is not responsible, the apparatus was not delivered until June and not erected until on or about October 1, 1908. Since the latter date the engine has been intermittently operated by the representatives of the pump company, but it has not yet been subjected to the duty trial upon which its final acceptance and the amount to be paid by the city is to be determined.

In order to supply water at the rate necessary for this new and larger pump, a new well was required and a contract for a well twenty feet in diameter and ten feet deeper than the old gallery adjacent to the present pumping station was let to Ellis & Buswell and completed in the autumn of the past year. The suction connection of the new pump with the well and the new force main connection with the distribution system were also laid during the year.

As has already been stated, for some years the supply of water has been inadequate during the dry season. In August, 1907, it became necessary to use Horn Pond water for several weeks. Further, the examinations of the State Board of Health have indicated a gradual depreciation in the quality of the water due to the excessive draft of pond water through an area of ground too small to effect satisfactory purification. An investigation for an additional supply from wells near Sucker Brook was therefore made and a contract for the driving of these wells will soon be let. A pipe-line —fourteen inches in diameter—from these wells will be laid along the shore of the pond to the new intake well at the pumping station. The development of this auxiliary supply is intended to draw part of the water required daily from the ground adjacent to the present station and a part from the new wells—in this way enlarging the area through which the water is drafted, and so in addition to obtaining a rate of inflow equal to the demands of the new pump, improving the quality of the water.

During the season of 1908 an investigation of leakage from the cement-lined mains was made, under the direction of Mr. Barbour, by shutting off districts of the distribution system and measuring the water used in these isolated districts between the hours of twelve midnight and four a. m. By this work it was found that the waste of water from the mains is a large percentage of the total amount pumped daily, and further, that it is not uniformly distributed but rather confined to certain portions of the system. In nineteen miles of the fifty-eight miles of pipe-lines ninety per cent of the night use of water was located—a result of great value, as it indicates the possibility of adapting the work of replacing the mains to the conditions as found and thus postponing the great expenditure necessary to any general replacement of the system.

The necessity of undertaking the development of an auxiliary supply is due to the waste of water through leakage from mains and services, and from careless use or bad plumbing in the premises of consumers. The reduction of this waste can be effected by a replacement of the cement-lined mains with cast-iron pipe, and by rendering the careless use of water expensive to the owners of the premises through the placing of meters on all services. Selling water by meter is the only logical way, but whether meters should be adopted with the present cement-lined mains wasting double the amount which can be saved by metering is, perhaps, debatable. Undoubtedly in the future—if Woburn grows—every means will have to be adopted to keep the consumption within the capacity of the present source of supply. To this end it is obvious that an immediate start should be made on some comprehensive scale to replace the cement pipe which the investigation of last year showed to be most defective.

For thirty-five years the water system has furnished water of acceptable quality and the income has not only maintained the works and paid off the bonded indebtedness originally incurred, but has also contributed largely to the support of other departments. This, on its face, is a most satisfactory showing, but present conditions indicate that the factor of depreciation has not been sufficiently taken into account. As has already been stated, new pumps and an auxiliary supply have become necessary and are about to be installed. It is equally obvious that to reduce leakage, lessen the cost of repairing breaks and better the insurance provided by the system, a considerable sum of money must be spent yearly in the replacement of depreciated mains. In 1908 there were seventy-one breaks in the distribution system, and the number is rapidly increasing from year to year. It is estimated that to replace the cement-lined mains would cost not less than $350,000.00, and yet this will probably have to be done within the next ten years. The investigation of leakage, however, showed practically all present leakage to be confined to about thirty-five per cent. of the length of pipe. It would seem as if a start should be made at once in the work of replacing this defective portion of the system.

In 1908, $27,676.63 was paid by the water department to other departments. To the writer, it seems as if the time has come for this surplus to be used in the necessary improvements of the water system. The present method of making the water consumers bear the burden of other public works is not equitable. Because one man uses more water than his neighbor is no proof that he derives any more benefit from the streets, or from the fire or police departments. If such surplus of income was employed to rebuild the distribution system, this would be a logical return to the consumers for their money. I therefore recommend that for the next five years the surplus income of the department be employed in the replacement of defective street mains.

Yours respectfully,

WM. H. CONWAY,
Commissioner of Water and Water Supply.

REPORT OF WATER REGISTRAR FOR THE YEAR 1908.

Woburn, Mass., December 31, 1908.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to submit the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1908.

Revenue and Expenditures.

New Pump and Pumping Station Addition.

Balance January 1, 1908	$29,876 68
Expended	18,539 66
Balance January 1, 1909	$11,337 02

New Well.

Appropriation	$10,000 00
Expended	9,344 40
Balance January 1, 1909	$655 60

Relaying Mains.

Appropriation		$15,000 00
Expended.		
Mill street (new main)	$1,734 02	
New Boston street (relaying)	4,974 67	
Richardson street (relaying)	1,237 43	
Overdraft street mains, construction account	3,661 70	
		$11,607 82
Balance January 1, 1909		$3,392 18

Service Construction.

Receipts.

Received for labor and material .	$397 14	
Transfer from maintenance acc't	338 86	
		$736 00

Expenditures.

New services	$736 00

Cost of Water Works to December 31, 1907	$619,325 84	
Construction for year ending December 31, 1908, less amount turned into city treasury	2,072 88	
		$621,398 72

MAINTENANCE.

Revenue.

Water Rate Collection:

1905 Account—		
Domestic rates	$119 00	
Fines	1 50	
Meter rates	14 39	
		$134 89
1906 Account—		
Domestic rates	$458 67	
Fines	2 00	
Meter rates	121 53	
		$582 20

1907 Account—			
Domestic rates		$889 05	
Fines		17 00	
Meter rates		293 82	
			$1,199 87
1908 Account—			
Domestic rates		$40,775 93	
Fines		102 25	
Seals		34 00	
Fractional rates		346 73	
Meter rates		9,616 68	
		50,875 59	
Discounts	$4,454 09		
Abatements	445 40		
		$4,899 49	$45,976 10
Miscellaneous receipts			$1,012 28
Total collections, 1908			$48,905 34
Transfer from New Well account			2,178 70
Transfer from New Pump account			50 00
			$51,134 04

Expenditures.

Maintenance:		
Cleaning reservoir	$99 00	
Cost of driving wells (refunded from New Well account)	2,178 70	
Expressing	39 15	
Amount carried forward.		$2,316 85

Amount brought forward.		$2,316 85
Miscellaneous	627 53	
Miscellaneous labor	1,071 03	
New meters	590 70	
Repairs to drinking fountains	88 99	
Repairs to gates	94 26	
Repairs to hydrants	345 13	
Repairs to meters and meter pits	286 75	
Repairs to services	1,485 65	
Repairs to standpipes	91 89	
Repairs to street mains	1,360 13	
Repairs to wagons	53 80	
Salary superintendent	1,200 00	
Sharpening picks, bars, etc.	54 63	
Stable	539 28	
Supplies	824 01	
Telephones	80 95	
		$8,794 73
Pumping Station:		
Care of grounds	$28 50	
Expressing	24 49	
Fuel	6,665 14	
Lighting	83 03	
Miscellaneous (repairs, etc.)	745 68	
New hot well	104 14	
New steam main	326 58	
Oil, waste and packing	249 98	
Repairs to boilers	197 77	
Repairs to pumps	70 89	
Salaries	4,191 13	
Amount carried forward.		$12,687 33

Amount brought forward.		$12,687 33
Supplies, tools, etc	407 25	
Telephone	48 52	
		$455 77
Office:		
Office supplies, etc.	$49 19	
Salaries	928 50	
		$977 69
Total expenditures, 1908		$25,232 37
Interest on water debt		508 10
Transfer to service, construction account		338 86
Transfer to sinking fund		25,054 71
		$51,134 04

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1908 INCLUSIVE

Year	No. Services	Receipts	Expenditures			Surplus
			Maintenance	Interest	Total	
1872	.....	....	....	$6,165 76	$6,165 76	‡$6,175 76
1873	498	$4,600 00	$4,976 99	11,424 37	16,401 36	‡11,801 36
1874	734	16,755 30	9,457 28	20,329 50	29,786 79	‡13,041 49
1875	835	17,117 25	7,166 44	24,500 00	31,666 34	‡14,549 29
1876	992	19,886 96	8,603 84	24,500 00	33,103 84	‡13,216 98
1877	1,084	22,508 03	6,848 84	25,108 59	31,957 43	‡9,449 40
1878	1,208	23,975 08	7,393 30	25,125 00	32,518 30	‡8,543 22
1879	1,290	24,060 29	7,527 40	25,798 60	33,326 00	‡8,165 71
1880	1,361	25,793 61	10,336 61	26,441 00	37,777 61	‡10,984 00
1881	1,413	27,608 62	8,291 00	26,741 00	35,032 00	‡7,423 38
1882	1,487	27,447 84	9,877 59	26,041 00	36,918 59	‡9,470 75
1883	1,559	29,925 52	9,276 27	27,041 00	36,317 27	‡6,391 75
1884	1,627	30,010 77	7,691 76	27,041 00	34,732 76	‡4,721 99
1885	1,730	30,999 51	8,974 37	27,041 00	36,016 37	‡5,015 86
1886	1,844	32,654 27	10,292 99	27,397 13	37,690 12	‡5,085 85
1887	1,966	34,266 65	†13,326 90	27,073 50	40,400 40	‡6,133 75
1888	2,061	34,002 02	10,697 99	16,982 50	27,680 40	6,321 53
1889	2,154	36,534 03	11,134 84	26,035 56	37,170 49	‡646 37
1890	2,233	37,944 36	12,351 11	25,306 75	37,657 86	336 50
1891	2,302	37,756 57	13,049 45	24,577 75	37,627 20	129 37
1892	2,369	37,405 88	11,033 61	24,483 75	35,517 36	2,888 52
1893	2,464	41,106 00	15,980 64	17,692 58	33,673 22	7,432 78
1894	2,559	42,528 48	12,629 09	12,985 75	25,614 84	17,913 64
1895	2,628	44,828 39	13,241 98	11,271 75	24,513 73	20,313 66
1896	2,709	45,750 29	20,671 20	10,070 00	30,741 20	15,009 09
1897	2,773	47,634 56	19,407 23	8,936 00	28,343 23	19,291 33
1898	2,821	48,013 24	11,164 80	7,812 00	18,976 80	29,036 44
1899	2,869	48,096 26	10,748 75	6,626 08	18,374 75	30,721 41
1900	2,894	§44,201 44	13,450 68	5,725 38	19,176 06	25,025 38
1901	2,925	‖42,814 87	11,627 99	4,774 00	26,402 09	26,412 88
1902	2,962	‖42,857 58	13,251 55	3,676 00	16,927 55	25,930 03
1903	2,996	‖47,616 21	13,995 10	2,660 00	16,655 10	30,961 11
1904	3,021	¶‖46,742 19	16,916 60	1,652 00	18,568 50	28,173 59
1905	3,057	¶‖45,921 42	16,507 14	608 00	17,115 14	28,806 28
1906	3,111	¶‖47,619 72	16,661 32	64 00	16,725 32	30,894 40
1907	3,151	¶‖48,115 45	19,265 04	410 00	19,675 04	28,440 41
1908	3,188	¶‖51,134 04	25,232 37	508 10	25,740 47	25,393 57
		$1,287,272 70	$439,060 07	$591,626 32	$1,030,686 39	$401,587 55

*Ten months.

†In this amount is included $1,000 transferred to Construction account.

‡Deficiency.

§Appropriation for hydrant service reduced from $5,050 to $1,730.

‖No appropriation for hydrant service.

¶Water rates on schools amounting to $537 not paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita: for domestic and other purposes.

WATER PUMPED				CONSUMPTION PER CAPITA			
				Annually		Daily	
Year	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons	For all Purposes Gallons	Domestic Purposes Gallons	For all Purposes Gallons
†1873–74	99,522,564	....	99.522,564	*10,625.94	*10,625.94	70.47	70.47
1874–75	228,114,068	13,946,060	242,060,128	28,841.35	25,298.92	65.31	69.31
1875–76	253,070,098	13,573,566	266,643,664	25,718.55	27,026.78	70.46	74.04
1876–77	225,350,577	18,775,415	244,125,992	32,285.46	24,142.20	61.05	66.14
1877–78	162,523,918	24,843,325	187,367,243	15,649.94	18.070.90	42.87	49.51
1878–79	202,212,585	30,414,959	237,627,544	19,535.80	22,295.69	53.52	61.08
1879–80	226,167,598	41,671,685	267,839,283	20,691.39	34,502.72	56.68	67.13
1880–81	239,085,793	30,460,765	269,546,558	21,550.90	24,296.60	59.04	66.56
1881–82	250,489,800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882–83	269,660,902	31,566,923	301,227,825	23,609.20	26,372.59	54.68	72.25
1883–84	214,940,593	37,978,384	252,918,977	18,551.75	21,829.70	50.82	59.80
1884–85	187,874,878	43,341,199	231,216,977	15,989.35	19,667.96	43.80	53.91
1885–86	218,303,505	33,042,819	251,346,324	18,043.10	20,774.14	49.43	56.91
1886–87	312,407,520	22,012,063	344,419,580	25,094.98	26,863.16	68.75	73.59
1887–88	285,924,528	38,363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
†1888 ...	193,639,657	41,854,103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889 ...	219,416,786	36,125,854	253,542,590	16,686.95	19,282.27	45.71	52.82
1890 ...	241,052,891	42,752,509	293,805,400	18,597.88	21,764.97	50.95	59.63
1891 ...	241,450,716	39,370,734	280,821,050	17,709.45	20,596.40	48.51	56.42
1892 ...	248,856,570	43,719,280	292,575,850	18,072.37	21,247.33	49.51	58.21
1893 ...	284,481,937	53,434,313	337,916,250	20,457.49	24,300.03	56.04	66.57
1894 ...	313,450,904	57,566,396	361,017,300	22,322.38	25,709.82	61.15	70.43
1895 ...	317,570,332	67,951,868	385,522,200	22,398,81	27,191.57	61.36	74.49
1896 ...	324,880,999	50,586,401	375,467,400	22,786.01	26,333.80	62.45	72.14
1897 ...	309,634,781	57,696,169	367,330,950	21,595.43	25,619.39	59.16	70.19
1898 ...	314,896,516	48,127,334	363,023,850	21,839.00	25,176.76	59.83	68.97
1899 ...	358,980,560	46,048,540	405,029,100	24,757.28	27,933.04	67.83	76.53
1900 ...	374,863,730	42,572,170	417,435,900	26,298.84	29,285.52	72.05	80.23
1901 ...	380,420,649	46,217,451	426,638,100	26,602.84	29.834.83	72.88	81.74
1902 ...	403,426,680	41,255,670	444,682,350	28,310.64	31.205.78	77.56	85.49
1903 ...	433,632,792	69,364,458	502,997,250	30,537.52	35,422.34	83.66	97.04
1904 ...	453,058,373	67,226,077	520,284,450	31,793.57	36,511.18	87.10	100.03
1905 ...	480,566,720	63,240,630	543,807,350	33,372.61	37,764.40	91.42	103.46
1906 ...	492,138,200	60,243,700	552,381,900	34,176.26	38,359.85	93.63	105.09
1907 ...	535,950,900	77,840,250	613,791,150	37,218.81	42,624.38	101.96	116.77
1908 ...	523,207,190	81,287,180	604,494,370	36,333.83	41,978.77	99.24	114.69

†Five months.   ‡Ten months.   *Five months.

STATEMENT OF EXPENSES BY MONTHS

MONTHS	MAINTENANCE		PUMPING STATION		OFFICE		TOTALS	
	Pay Rolls	Supplies	Pay Rolls	Supplies	Pay Rolls	Supplies	1908	1907
January	$342 90	$252 10	$263 16	$321 12	$69 20	$22 14	$1,270 62	$1,501 27
February	486 48	159 20	340 94	257 97	86 50	....	1,331 09	864 37
March	352 69	160 87	247 14	1,355 57	70 70	....	2,186 97	1,556 59
April	401 86	417 36	315 21	144 65	73 70	10 35	1,363 13	1,401 03
May	444 48	149 49	287 56	378 70	73 70	10 00	1,343 93	1,656 11
June	423 87	316 83	409 05	404 28	86 50	....	1,640 53	951 95
July	545 78	876 82	396 83	992 42	78 20	....	2,890 05	1,513 82
August	756 61	2,485 22	442 25	686 72	95 50	....	4,466 30	1,914 35
September	438 77	260 84	484 99	700 76	69 20	1 50	1,956 06	1,827 46
October	442 18	564 10	452 89	1,485 34	86 50	1 80	3,032 81	2,261 34
November	269 66	88 65	467 29	1,233 99	69 20	....	2,128 79	2,237 97
December	324 62	150 20	448 07	626 20	69 60	3 40	1,622 09	1,578 78
	$5,229 90	$5,881 68	$4,555 38	$8,587 72	$928 50	$49 19	$25,232 37	$19,265 04

The following is a statement of meters in use together with those on hand:

MAKE	½ inch	⅝-inch	¾-inch	1-inch	1¼-inch	1½-inch	2-inch	4-inch	Tota
Crown	..	..	3	8	..	1	5	..	17
Empire	..	..	1	1	..	1	..	..	3
Gem	..	..	..	..	..	..	..	2	2
Hersey	..	..	5	7	1	..	5	1	19
Indicator	..	..	..	..	..	..	1	..	1
King	..	2	..	6	..	..	..	..	8
Nash	..	..	..	1	..	..	..	..	1
Neptune	..	..	15	..	..	..	2	..	17
Thompson	..	..	2	2	..	1	1	..	6
Union	2	..	3	13	..	4	13	1	36
Worthington	..	..	..	7	..	..	4	..	11
Total	2	2	29	45	1	7	31	4	121

Water Service.

Whole number put in to December 31, 1907	3,151
Number added in 1908	37
Total	3,188
Total number abandoned	65
Vacant services	56

Vacancies.

Shut off for non-payment	7
Turned on upon payment	4
Number remaining shut off for non-payment	5
Faucets locked	274
Faucets unlocked	212

NUMBER OF FIXTURES

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals Jan. 1 1909	Totals Jan. 1 1908
Faucets	1,100	1,053	1,155	1,510	436	736	285	6,275	6,196
Bath Tubs	145	125	145	179	50	121	23	788	763
Water Closets	494	411	437	649	91	127	46	2,255	2,162
Hose Attachments ..	91	116	133	131	37	94	35	637	637
	1,830	1,705	1,870	2,469	614	1,078	389	9,955	9,758

STATEMENT OF INCOME FROM WATER RATES

	1904	1905	1906	1907	1908
Domestic Service.	$37,426 53	$37,921 78	$38,657 64	$40,933 70	$42,746 13
Meter Service ...	8,937 67	7,721 71	8,458 82	10,454 94	10,046 42
Totals	$46,364 20	$45,643 40	$47,116 46	$51,388 64	$52,792 55
Abatements and Discount	533 90	510 78	465 73	4,675 06	4,899 49
Totals	$45,830 30	$45,132 71	$45,650 73	$46,713 58	$47,893 06

Uncollected Water Rates.

Domestic Rates, 1906	$11 50
Domestic Rates, 1907	141 50
Domestic Rates, 1908	1,218 75
Fractional Rates	24 00
Meter Rates	158 80
	$1,554 55

WATER TAKERS

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals	
								Jan. 1. 1908	Jan. 1, 1909
Almhouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	5	1	1	..	..	..	6	7
Bakehouses	..	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	11	..	..	12	12
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	431	487	482	494	238	401	194	2,710	2,727
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevator	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	2	..	1	2	1	7	7
Families	600	685	658	686	285	461	345	3,701	3,720
Foundries	..	1	..	..	1	..	..	2	2
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	4	..	1	8	9	13	33	36
Halls, Clubs, etc.	5	1	10	14	1	1	..	32	32
Hose and Fountains	90	115	132	129	36	94	32	628	628
Hotels	1	1	1	..	..	..	..	3	3
Hydrants	48	63	47	58	43	81	35	373	377
Irrigation	1	..	5	1	5	5	13	32	32
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	18	4	5	2	13	3	47	48
Motors	2	..	2	4	..	..	..	8	8
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	..	3	..	2	3
Public Library	..	..	1	..	..	1	..	1	2
Public Park	..	..	1	..	..	1	..	1	2
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	13	9	10	7	..	..	..	35	39
School Houses	5	1	2	3	5	2	2	20	20
Stables	50	74	50	24	57	44	31	330	330
Stores, Shops and Offices	24	40	58	190	11	12	3	338	338
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	7	..	1	1	18	18

COAL CONSUMED AND DUTY OF PUMPING ENGINES

1908	Number of Hours Pumping	Pounds of Coal used Firing and Banking	Pounds of Coal used Pumping	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir	Average Height of Water in Pond above High Mark
January	378	20,700	176,500	48,539,400	1,565,787	246	215	16	25
February ...	467	11,900	187,000	48,973,050	1,688,725.5	246	215.7	16.7	26.7
March	345½	21,700	176,400	46,172,700	1,489,441.9	233	215.9	16.9	27.1
April†	416½	16,300	156,700	44,276,400	1,363,754.8	255.9	213.5	14.5	26.5
May	341	21,900	156,000	43,923,600	1,416,890.3	246.9	215	16	28
June	468	18,200	180,400	52,574,550	1,752,485	264.7	214	15	23.4
July	727	1,400	213,700	60,769,800	1,960,316	282	209.2	10.2	20.1
August	526½	14,200	174,200	48,532,050	1,565,550	257.6	214	15	17.5
September ..	626	5,600	192,300	52,831,800	1,761,060	266	210.5	11.5	12.5
October.....	727	900	206,800	55,992,300	1,806,203	269	212.5	13.5	9.9
November ..	718½	....	201,100	49,289,100	1,642,970	245	211.9	12.9	9.4
December ..	742	....	211,400	52,619,620	1,697,407	248	212.7	13.7	8.4
Total	6,483	132,800	2,232,500	604,494,370	1,656,148.9	255.5	213.3	14.3	19.5

†During this month 2,000,000 gallons were used in cleaning reservoir making an actual daily average consumption of 1,363,754.8 gallons.

Number of gallons pumped, 1907..........	613,791.150
Number of gallons pumped, 1908..........	604,494,370
Coal consumed, 1907.....................	1,185 19-20 tons
Coal consumed, 1908.....................	1,182 13-20 tons

SUMMARY OF STATISTICS.

For Year Ending 1908.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

City of Woburn, Middlesex County, State of Massachusetts.

Population by Census of 1905, 14,400.
Date of construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery near Horn Pond.
Mode of supply, pumping direct and to reservoir.

Pumping.

1. Builders of pumping machinery, Worthington & Blake.
2. Description of fuel used, (a) kind, bituminous coal; (b) brand of coal; (c) average price of coal per gross ton, delivered, $4.92; (d) percentage of ash, 9; (e) wood, price per cord, none used.
3. Coal consumed for the year, 2,365,300 pounds.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none .

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 604,494,370 gallons. without allowance for slip, which a recent test shows to be 17 per cent.
7. Average static head against which pumps work, 210.3 feet.
8. Average dynamic head against which pumps work, 213.3 feet.
9. Number of gallons pumped per pound of equivalent coal (3), 255.5.

10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (3). Equals 45,463,507.

Cost of pumping, figured on pumping station expenses, viz., $13,143.10.

11. Per million gallons pumped, $21.76.

12. Per million gallons raised one foot (dynamic), $0.102.

Cost of pumping, figured on total maintenance, viz., $25,232.37.

13. Per million gallons pumped, $41.77.

14. Per million gallons raised one foot (dynamic), $0.195.

FINANCIAL.

Maintenance.

Receipts.

From Consumers:			
A.	Water rates, fixture	$41,966 13	
B.	Water rates, meter	10,046 42	
C.	Net receipts for water (A) plus (B)	$52,012 55	
D.	Miscellaneous (rent, repairs, sales, etc.)	3,240 98	
		$55,253 53	
D2.	Discount and abatements	4,899 49	
E.	Total from consumers		$50,354 04
From Public Funds:			
F.	Hydrants		
G.	Fountains	$275 00	
H.	Street waterings	250 00	
I.	Public buildings	255 00	
J.	General appropriations		
	Total from Public Funds..		780 00
K.	Gross receipts from all .. sources		$51,134 04

Expenditures.

AA.	Management and repairs ..	$25,232 37	
BB.	Interest on bonds	508 10	
CC.	Total maintenance for year		$25,740 47
DD.	Transfer to Service Construction account		338 86
DDD.	Balance transferred to Sinking Fund		25,054 71
K.	Total		$51,134 04

Consumption.

1. Estimated total poulation at date, 14,400.
2. Estimated population on line of pipe, 14,300.
3. Estimated population supplied, 14,300.
4. Total consumption for the year, 604,494,370 gallons.
5. Passed through meters, 81,287,180.
6. Percentage of consumption metered, .134.
7. Average daily consumption, 1,656,148.9.
8. Gallons per day to each inhabitant, 114.69.

Distribution.

Mains.

1. Kind of pipe, cement and cast iron.
2. Sizes, from 4-inch to 14-inch.
3. Extended during the year, 1,733 feet.
4. Discontinued, —— feet during the year.
5 Total now in use, 57.21 miles.
6. Cost of repairs per mile, $23.77.
7. Number of leaks per mile, 1.24.
8. Length of pipes less than 4 inches diam., 5.81 miles.
9. Number of hydrants added during year (public and private), 4.
10. Number of hydrants (public and private) now in use, 377.

11. Number of stop gates added during the year, 8.
12. Number of stop gates now in use, 446.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow-off gates, 17.
15. Range of pressure on mains at centre of city, 70 pounds to 75 pounds.

Services.

16. Kind of pipe, lead lined, cement lined and galvanized.
17. Sizes, 1-inch.
18. Extended, —— feet.
19. Discontinued, —— feet.
20. Total now in use, —— miles.
21. Number of service taps added during year, 37.
22. Number now in use, 3,188.
23. Average length of service, —— feet.
24. Average cost of service for the year, $19.89..
25. Number of meters added, 13.
26. Number now in use, 75.
27. Percentage of service metered, .023.
28. Percentage of receipts from metered water (B divided by K), .196.
29. Number of motors and elevators added, 1.
30. Number now in use, 10.

Respectfully submitted,

REDMOND E. WALSH,

Water Registrar.

MASS. STATE BOARD OF HEALTH,
ENGINEERING DEPARTMENT.

1909

ANNUAL REPORT

OF THE

WATER DEPARTMENT

OF THE

CITY OF WOBURN

FOR THE YEAR 1909

THE NEWS PRINT, WOBURN, MASS.
1910

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REPORT OF COMMISSIONER OF WATER AND WATER SUPPLY

To the Board of Public Works, Woburn, Mass.

Gentlemen:—I beg to submit my annual report as Water Commissioner for the year ending December thirty-first, 1909. The appended report of the superintendent presents, in detail, the routine work of the department and need not be here repeated. Attention may be called, however, to the increasing number of breaks reported by the superintendent—one hundred and twenty-three (123) in the past year as compared with seventy-one (71) in 1908 and forty-four (44) in 1907. Obviously depreciation is progressing with greater rapidity as the years go by and the time will soon arrive when the cement lined mains must be abandoned. If application were made to the Legislature for the right to issue one hundred thousand dollars ($100,000.00) worth of bonds, the money to be expended in replacement of the mains as it may be voted by the City Council, it would be a step in the right direction and taken none too soon to meet the present rapid deterioration of the cement pipes. There are two obvious reasons for this replacement of the cement pipes: first, economy in the cost of repairs and in reduction of leakage, and second, the betterment of the fire service and the elimination of the present danger that during some fire water-hammer, created by too rapid shutting off of hose streams, will result in a break at a most critical time. The reduction in leakage alone and the saving in fuel now burned to pump water into the reservoir only to have it subsequently leak out into the ground, will alone meet, in no inconsiderable measure, the interest on the cost of the improvement. That this problem of waste is a serious question is shown by the fact that the amount of water pumped in 1909 exceeded by twenty (20) per cent. that in the preceding year.

The work to be first done in the replacement of mains should therefore be laid out with a view both to the betterment of the fire service and a reduction of waste in those parts of the system where leakage has been proved, by the tests of our engineer, to be greatest, and will, presumably, include some relaying of the large leading mains as well as some of the outlying pipes. The size of new pipes in the leading mains should be made such as, in combination, will effect the best fire protection at the least cost and so distributed as to furnish duplicate connections, wherever possible, with the storage reservoir or source of supply.

The new pump has not yet passed the test, necessary under the contract, for its final acceptance. In March the ring casting between the valve decks of the low pressure water-end cracked, but it was subsequently replaced and the pump was operated almost continuously during July and August and until August thirty-first, when the corresponding casting on the other side of the pump broke. This second break suggested that in addition to the replacement of the defective casting, other changes, to strengthen the engine, were advisable and, after considerable negotiation with the contractor, a supplementary agreement was reached whereby various improvements are to be made. The work made necessary the taking down of the engine, which was begun November first and is to be completed so that the apparatus may be in service April first, 1910. The new pump during the past year was operated for various lengths of time on one hundred and forty (140) days and during August, when it ran continuously, proved its ability to cut down the fuel consumption to about one-half (½) that required by the old apparatus. The efficiency test, on which acceptance and the final amount to be paid depends, will be made as soon after April first as circumstances permit.

In February a contract for driving and connecting up fifty (50) two and one-half inch (2½″) wells was let to B. F. Smith

& Company, and completed in the early summer. These wells are located in the valley of Sucker Brook and are connected with the old supply by a fourteen inch (14″) cast iron pipe, which is laid along the shores of the pond, terminating in the new well, constructed in the preceding year, the end of the pipe being turned down into this well and extending almost to the bottom. The work of laying the fourteen inch (14″) pipe was done under the direction of the superintendent. With the lowering of the water in the new well by the pump a siphonic action is obtained which drafts the water from the driven wells. To remove the air from the siphon line a small water-wheel, operated by city pressure, and a vacuum pump and tank, were installed in the pumping station. The tank is connected with the high point in the siphon line by two two and one-half inch (2½″) pipes. The operation of the vacuum pump exhausts the air from the pipe line and tank, filling the latter with water. The air, which during the operation of the siphon accumulates at the high point, finds its way into the tank, the water in which consequently lowers and, moving a float, automatically starts up the vacuum pump, which again exhausts the accumulated air. In this way, with practically no attendance and without the necessity of installing a pumping apparatus in a station to be built at Sucker Brook as was originally contemplated, water is brought over to the new supply from the old works with practically no attendance and but little cost. The amount of water used for the operation of the vacuum pump is about ten thousand (10,000) gallons per day and the cost of this water, figuring it as the value of the fuel necessary to re-pump it into the reservoir, would be equivalent to about twelve (12) cents per day. For this expense from one million to one million, five hundred thousand (1,000,000 to 1,500,000) gallons per day can be drafted from the Sucker Brook watershed to the new well so long as the ground water near Sucker Brook stands at a level sufficiently above the water in the pump well. As a result of using this supply the water in the ground adjacent to the station was raised three and one-half (3½) feet in

August, at a time when the daily consumption was almost two million (2,000,000) gallons and there has been ample water obtainable at all times—despite the fact that the year 1909 proved to be the dryest on record, in point of stream flow. Without question it would have been necessary to use Horn Pond to supply the average daily consumption of one million, eight hundred and sixteen thousand (1,816,000) gallons—if this new supply had not been installed.

Reference should also be made to the improvement in the quality of the water during the time the auxiliary supply was in service, as may be seen in the analysis of the State Board of Health herein presented on another page of this report. The sample of July twenty-eighth was taken at the time when the new supply was furnishing a part of the water pumped, while that of September first was collected two days after shutting off the new supply. The first sample—by comparison with that of June thirtieth, when all water was being drafted from the old gallery—shows a reduction of ninety (90) per cent. in the free ammonia, thirty-five (35) per cent. in the albuminoid ammonia, sixteen (16) per cent. in chlorine, twenty-five (25) per cent. in nitrates, sixty (60) per cent. in iron and thirty (30) per cent. in hardness or in total a great improvement in the quality of the water.

It can therefore be stated that this new supply, developed at small cost, is a success in the betterment of the quality of the water and in the enlargement of the capacity of the source. Such a result, however, does not justify the present extravagant consumption or waste—amounting to one hundred and twenty-five (125) gallons per capita; rather it should prove an additional incentive to the adoption of every reasonable means of conserving the present source in order that it may furnish Woburn with a water of good quality for a reasonable time in the future.

I again desire to call your attention to the obvious necessity of devoting all surplus income of the Water Department to the replacement of mains. The issue of new bonds will only partially meet the necessary expense in this direction and there would seem to be no possible argument for the diversion of the income of the Department to other purposes.

Respectfully submitted,

WM. H. CONWAY,
Commissioner of Water and Water Supply.

REPORT OF SUPERINTENDENT OF WATER DEPARTMENT FOR 1909

Woburn, Mass., December 31, 1909.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to submit the following report upon the condition of the work and operation of the Department for the year ending December 31, 1909.

Main Pipe.

During the year we completed the relaying of the six (6) inch main in Mishawum road. This work was commenced in 1908, but owing to the lateness of the season we were unable to complete the work. There were 971 feet of 6 inch pipe laid in this street. In Felton street about 1,172 feet of 1¼ inch temporary main was replaced with a 6 inch cast iron main. This improvement gives the residents of this section fire protection as well as additional supply of water.

The old 4 inch cement pipe in Main street from the car barns to North Maple street, was replaced with a 6 inch cast iron pipe a distance of 3,038 ft. We commenced to repair this pipe but found it would be useless, owing to the damage caused by lightning. We laid 1,730 feet of 14 inch cast iron pipe from the Artesian wells located on Butman's land near the pond to the new well at the station, and also laid 1,335 feet of 8 inch cast iron pipe from the same wells to the 14 inch cement main to the reservoir.

Repairs on Mains.

We have had 123 breaks in mains during the year. They were:

1	on	2½	inch
78	"	4	"
36	"	6	"
5	"	10	"
1	"	12	"
2	"	14	"
123			

Of the above breaks 77 were caused by lightning, 37 by thin lining, 4 by closing of hydrants, 2 by pipe settling and 3 were joint leaks.

The total number of breaks during the past five years:

1905	53
1906	45
1907	44
1908	71
1909	123

Services.

This year there have been 34 new services laid and 29 old services replaced. Repairs were made on 527, divided as follows: 73 required cleaning, 29 replaced, 115 were shut off for repairs, and general repairs were made on 311. There were 21 new service boxes set. Repairs were made on 13, 21 were excavated and reset, 27 replaced with new, 31 raised and 85 lowered to grade.

Gates and Gate Boxes.

Nine new gates have been added to our system. These were located as follows: three on Mishawum road, one on Felton street, three at the Pumping Station and two on North Main street. Seven gate boxes have been replaced with new ones and three have been raised.

Hydrants.

During the progress of the season's work the following changes have been made. Two hydrants have been added to our system, making a total of 379 now in use. Repairs were made on seven without change of location. The following table shows where old hydrants were replaced with those of a modern make, as recommended in my former reports:

Water Street	near No. 40
Central Street	" Thorn Street
Mishawum Road	" No. 24
Mishawum Road	" Middle Street
Lowell Street	" Wyman Street
Washington Street	" Grape Street
Washington Street	" No. 45
Border Street	" Pickering Street
North Main Street	" Car barns
North Main Street	" No. 955
North Main Street	" No. 985
North Main Street	" No. 1024
Montvale Avenue	" Albany Street

The usual examinations have been made and they are all in good working condition.

Meters.

There were six 2-inch Union meters and six 1-inch King meters added, making 87 now in use. Twenty-five meters were replaced and set with new ones and seven required repairs.

Street Watering Standpipes.

There are now fourteen standpipes in use, no new ones being added. The repairs on these standpipes have been made by the employes of this department and charged to the account of Street Watering, Street Department.

Pumping Station and Grounds.

On account of the large amount of pipe laying to the artesian wells located on Butman's land, and the construction of the new well in 1908, it was necessary to do a large amount of grading on the grounds adjoining the station. This work consisted of levelling the bank on the westerly side of the pond, cutting down dead trees, and seeding the grounds.

Reservoir.

The reservoir has been cleaned out once. Nothing obnoxious was found, and not so much sediment as in former years. The sediment found was scraped up and carefully removed. I renew my recommendations of past years that the bottom and side walls be concreted. This would necessitate the blasting of the bottom, and the cutting off of a portion of the back.

Electrolysis.

The work of the department in mains in the vicinity of the street car lines has brought to light no indication of any material change of electrical conditions. The break in the main near the Boston & Northern car barn, North Woburn, was apparently due to the grounding of Electric and Telephone wires, which serve to conduct the lightning to our pipes. I would recommend that action be immediately taken to compel the companies to remedy this cause of so many of our breaks.

Again it is necessary for me to call your attention to the lack of room in our repair shop on Winn street. Our rented store room is also over crowded, and in view of the contemplated improvements to our system, we should have larger quarters. We now have two horses in the department, one having been sold during the past year. I would recommend the purchasing of two horses, one to replace one we now have, which is too light for our work. We are also in need of two wagons. One for general purposes, and one for hauling pipe as it is now necessary to employ a team for this purpose.

Recommendations.

I would recommend the systematic inspection of all premises supplied with water, and the restriction of all preventable wastes. This method would mean additional expense; however, I believe it would greatly aid in the cutting down of the wasteful use of water. I desire to call your attention to the following list of streets where improvements are needed:

STREETS	Size of pipe now in use	Size of pipe recommended
Nichols	4 inch	6 inch
Poole	4 "	6 "
No. Warren	4 "	6 "
Harrison avenue	4 "	6 "
Munroe	4 "	6 "
Morse	4 "	6 "
Garfield avenue	4 "	8 "
Carter	4 "	6 "
Lexington, 6,200 feet	0 "	6 "
Federal	0 "	6 "
Park	1 "	6 "
Thorn	1 "	6 "
Auburn, 200 feet	4 "	6 "
Montvale avenue	10 "	12 "
Winn, 600 feet	6 "	6 "
Broad, 572 feet	1 "	6 "

Of the above, my reasons for recommending Broad, Winn and Auburn streets, is for the purpose of eliminating dead ends, which should not exist on our system. I recommend the laying of the Lexington street main as a benefit to our system on that side of the city. At present the water on Cambridge street is dependent upon the Bedford street main, and whenever a break occurs on Bedford street beyond South Bedford street, this whole section has to be shut off. When repairs are necessary it takes two men one-half day to notify water takers that the water will be shut off, and in the spring and summer when the market gardeners are busy setting out small plants, the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection. By putting in this main we would have a good circulation of water and additional pressure for fire purposes.

Respectfully submitted,

ROBERT T. SPENCER,
Superintendent.

REPORT OF WATER REGISTRAR FOR THE YEAR 1909

Woburn, Mass., December 31, 1909.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to submit the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1909.

REVENUE AND EXPENDITURES.

Auxiliary Water Supply.

Appropriation	$10,000 00
*Expended	15,130 38
Overdrawn January 1, 1910	$5,130 38

Relaying Mains.

Balance January 1, 1909	$3,392 18	
Transfer from street mains Const. Acc't.	147 41	
		$3,539 59
Expended:		
Main street	$3,420 26	
New Boston street	1,710 12	
		$5,130 38
Overdrawn January 1, 1910		$1,590 79

---

*Includes $1,049.39 expended in grading Pumping Station grounds and shores of pond approaching New Wells.

New Well.

Balance January 1, 1909	$655 60
Expended	3,162 48
Overdrawn January 1, 1910	$2,506 88

Street Mains Construction.

Appropriation	$1,000 00
Expended (Felton street)	$1,000 00

New Pump and Pumping Station Addition.

Balance January 1, 1909	$11,337 02
Expended	992 77
Balance January 1, 1910	$10,344 25

Service Construction.

Received for labor and material ..	$275 60	
Transfer from Maintenance Acc't .	757 71	
		$1,033 31
Expended:		
Services		$1,033 31
Cost of Water Works to December 31, 1908		$621,398 72
Construction for year ending December 31, 1909, less amount turned into City Treasury		1,757 71
		$623,156 43

MAINTENANCE.

Revenue.

Water Rate Collections:			
1907 Account—			
Domestic Rates		$101 00	
Fines		1 50	
			$102 50
1908 Account—			
Domestic Rates		$728 19	
Fines		20 75	
Meter Rates		132 75	
			$881 69
1909 Account—			
Domestic Rates		$41,191 52	
Fines		62 75	
Seals		28 75	
Meter Rates		11,226 76	
Fractional Rates		433 73	
		$52,943 51	
Discounts	$4,837 11		
Abatements	303 30		
		$5,140 41	
			$47,803 10
Miscellaneous Receipts:			
Sale of horse		$30 00	
Received for coal used by contractor on New Well		674 50	
Sundry receipts (repairs, etc.)		436 32	
			$1,140 82
Total Collections 1909			$49,928 11

Expenditures.

Maintenance:		
Expressing	$23 04	
Investigation of leakage in mains (Engineer)	401 35	
Miscellaneous	339 40	
Miscellaneous labor	1,666 30	
New Meters	661 20	
Repairs to drinking fountains	50 78	
Repairs to gates	37 48	
Repairs to hydrants	221 17	
Repairs to Meters and Meter Pits	440 40	
Repairs to services	1,072 60	
Repairs to standpipes	20 56	
Repairs to street mains	2,024 13	
Repairs to wagons	65 15	
Reservoir (cleaning, etc.)	170 50	
Salary (Supt.)	1,200 00	
Sharpening picks, bars, etc.	50 40	
Stable	599 36	
Supplies	464 71	
Telephones	60 93	
		$9,569 46
Pumping Station:		
Care of grounds	$95 86	
Expressing	13 00	
Fuel	4,231 04	
Lighting	101 70	
Miscellaneous	85 98	
Oil, waste and packing	298 38	
Repairs (Engineer's house, station and coal sheds)	669 05	
Repairs to Boilers	82 98	

Repairs to pumps	27 97	
Salaries	4,114 66	
Supplies	283 58	
Telephone	41 35	
		$10,045 55
Office:		
Salaries	$922 50	
Supplies	70 05	
		$992 55
Total expenditures, 1909		$20,607 56
Interest on water debt		2,780 00
Transfer to service construction account		757 71
Transfer to sinking fund		25,782 84
		$49,928 11

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1909 INCLUSIVE

Year	No. Services	Receipts	EXPENDITURES			Surplus
			Maintenance	Interest	Total	
1872	.....	....	....	$6,165 76	$6,165 76	‡$6,175 76
1873	498	$4,600 00	$4,976 99	11,424 37	16,401 36	‡11,801 36
1874	734	16,755 30	9,457 28	20,329 50	29,786 79	‡13,041 49
1875	835	17,117 25	7,166 44	24,500 00	31,666 34	‡14,549 29
1876	992	19,886 96	8,603 84	24,500 00	33,103 84	‡13,216 98
1877	1,084	22,508 03	6,848 84	25,108 59	31,957 43	‡9,449 40
1878	1,208	23,975 08	7,393 30	25,125 00	32,518 30	‡8,543 22
1879	1,290	24,060 29	7,527 40	25,798 60	33,326 00	‡8,165 71
1880	1,361	25,793 61	10,336 61	26,441 00	37,777 61	‡10,984 00
1881	1,413	27,608 62	8,291 00	26,741 00	35,032 00	‡7,423 38
1882	1,487	27,447 84	9,877 59	26,041 00	36,918 59	‡9,470 75
1883	1,559	29,925 52	9,276 27	27,041 00	36,317 27	‡6,391 75
1884	1,627	30,010 77	7,691 76	27,041 00	34,732 76	‡4,721 99
1885	1,730	30,999 51	8,974 37	27,041 00	36,016 37	‡5,015 86
1886	1,844	32,654 27	10,292 99	27,397 13	37,690 12	‡5,085 85
1887	1,906	34,266 65	†13,326 90	27,073 50	40,400 40	‡6,133 75
1888	2,061	34,002 02	10,697 99	16,982 50	27,680 40	6,321 53
1889	2,154	36.534 03	11,134 84	26,035 56	37,170 49	‡646 37
1890	2,233	37,944 36	12,351 11	25,306 75	37,657 86	336 50
1891	2,302	37,756 57	13,049 45	24,577 75	37,627 20	129 37
1892	2,369	37,405 88	11,033 61	24,483 75	35,517 36	2,888 52
1893	2,464	41,106 00	15,980 64	17,692 58	33,673 22	7,432 78
1894	2,559	42,528 48	12,629 09	12,985 75	25,614 84	17,913 64
1895	2,628	44,828 39	13,241 98	11,271 75	24,513 73	20,313 66
1896	2,709	45,750 29	20,671 20	10,070 00	30,741 20	15,009 09
1897	2,773	47,634 56	19,407 23	8,936 00	28,343 23	19,291 33
1898	2,821	48,013 24	11,164 80	7,812 00	18,976 80	29,036 44
1899	2,869	48,096 26	10,748 75	6,626 08	18,374 75	30,721 41
1900	2,894	§44,201 44	13,450 68	5,725 38	19,176 06	25,025 38
1901	2,925	‖42,814 87	11,627 99	4,774 00	26,402 09	26,412 88
1902	2,932	‖42,857 58	13,251 55	3,676 00	16,927 55	25,930 03
1903	2,996	‖47,616 21	13,995 10	2,660 00	16,655 10	30,961 11
1904	3,021	¶‖46,742 19	16,916 60	1,652 00	18,568 50	28,173 59
1905	3,057	¶‖45,921 42	16,507 14	608 00	17,115 14	28,806 28
1906	3,111	¶‖47,619 72	16,661 32	64 00	16,725 32	30,894 40
1907	3 151	¶‖48,115 45	19,265 04	410 00	19,675 04	28,440 41
1908	3,188	¶‖51,134 04	25,232 27	508 10	25,740 47	25,393 57
1909	3,222	¶‖49,928 11	20,607 56	2,780 00	23,387 56	26,540 55
		$1,337,200 81	$459,667 63	$594,406 32	$1,054,073 95	$423,128 10

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*Ten months.

†In this amount is included $1,000 transferred to Construction account.

‡Deficiency.

§Appropriation for hydrant service reduced from $5,050 to $1,730.

‖No appropriation for hydrant service.

¶Water rates on schools amounting to $537 not paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita: for domestic and other purposes.

WATER PUMPED				CONSUMPTION PER CAPITA			
				Annually		Daily	
Year	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons	For all Purposes Gallons	Domestic Purposes Gallons	For all Purposes Gallons
†1873-74.....	99,522,564	....	99,522,564	*10,625.94	*10,625.94	70.47	70.47
1874-75.....	228,114,068	13,946,060	242,060,128	28,841.35	25,298.92	65.31	69.31
1875-76.....	253,070,098	13,573,566	266,643,664	25,718.55	27,026.78	70.46	74.04
1876-77.....	225,350,577	18,775,415	244,125,992	32,285.46	24,142.20	61.05	66.14
1877-78.....	162,523,918	24,843,325	187,367,243	15,649.94	18,070 90	42.87	49.51
1878-79.....	202 212,585	30,414,959	237,627,544	19,535.80	22,295.69	53.52	61.08
1879-80.....	226,167,598	41,671,685	267,839,283	20,691.39	34,502.72	56.68	67.13
1880-81.....	239,085,793	30,460,765	269,546,558	21,550.90	24,296.60	59.04	66.56
1881-82.....	250,489,800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882-83.....	269,660,902	31,566,923	301,227,825	23,609.20	26,372.59	54.68	72.25
1883-84.....	214,940,593	37,978,384	252,918,977	18,551.75	21,829.70	50.82	59.80
1884-85.....	187,874,878	43,341,199	231,216,977	15,989.35	19,667.96	43.80	53.91
1885-86.....	218,303,505	33,042,819	251,346,324	18,043.10	20,774.14	49.43	56.91
1886-87.....	312,407,520	22,012,063	344,419,580	25,094.98	26,863.16	68.75	73.59
1887-88.....	285,924,528	38,363,477	324.288,000	22,967.67	26,049.32	61.28	71.36
†1888........	193,639,657	41,854,103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889........	219,416,786	36,125,854	253,542,590	16,686.95	19,282.27	45.71	52.82
1890........	241,052,891	42,752,509	293,805,400	18,597.88	21,764.97	50.95	59.63
1891........	241,450,716	39,370,734	280,821,050	17,709.45	20,596.40	48.51	56.42
1892........	248,856,570	43,719,280	292,575,850	18,072.37	21,247.33	49.51	58.21
1893........	284,481,937	53,434,313	337,916,250	20,457.49	24,300.03	56.04	66.57
1894........	313,450,904	57,566,396	361,017,300	22,322.38	25,709.82	61.15	70.43
1895........	317,570,332	67,951,868	385,522,200	22,398.81	27,191.57	61.36	74.49
1896........	324,880,999	50,586,401	375,467,400	22,783.01	26,333 80	62.45	72.14
1897........	309,634,781	57,696,169	367,330,950	21,595.43	25,619.39	59.16	70.19
1898........	314,896,516	48,127,334	363,023,850	21,839.00	25,176.76	59.83	68.97
1899........	358,980,560	46,048,540	405,029,100	24,757.28	27,933.04	67.83	76.53
1900........	374,863,730	42,572,170	417,435,900	26,298.84	29,285.52	72.05	80.23
1901........	380,420,649	46,217,451	426,638,100	26,602.84	29,834.83	72.88	81.74
1902........	403,426,680	41,255,670	444,682,350	28,310.64	31,205.78	77.56	85.49
1903........	433,632,792	69,364,458	502,997,250	30,537.52	35,422.34	83.66	97.04
1904........	453,058,373	67,226,077	520,284,450	31,793.57	36,511.18	87.10	100.03
1905.	480,566,720	63,240,630	543,807,350	33,372.61	37,764.40	91.42	103.46
1906........	492,138,200	60,243,700	552,381,900	34,176.26	38,359.85	93.63	105.09
1907........	535,950,900	77,840,250	613,791,150	37,218.31	42,624.38	101.96	116.77
1908........	523,207,190	81,287,180	604,494,370	36,333.83	41,978.77	99.24	114.69
‖1909........	580,831,290	79,573,950	660,405,240	40,335.50	45,861.47	110.50	125.64

† Five months. ‡ Ten months. * Five months. ‖ 10% allowance for slip.

STATEMENT OF EXPENSES BY MONTHS

MONTHS	MAINTENANCE		PUMPING STATION		OFFICE		TOTALS	
	Pay Rolls	Supplies	Pay Rolls	Supplies	Pay Rolls	Supplies	1909	1908
January	$563 93	$224 22	$480 77	$222 90	$86 50		$1,578 32	$1,270 62
February	371 09	83 31	316 92	262 84	69 20		1,103 36	1,331 09
March	474 99	253 21	321 43	895 77	69 20		2,014 60	2,186 97
April	893 33	270 45	349 94	348 71	86 50	$13 45	1,962 38	1,363 13
May	549 65	304 20	313 28	469 58	69 20	1 50	1,707 41	1,343 93
June	426 72	452 60	294 24	441 87	69 20		1,684 63	1,640 53
July	588 22	516 40	370 03	619 02	95 50		2,189 17	2,890 05
August	405 85	264 24	312 74	534 70	78 20		1,595 73	4,466 30
September	376 81	557 42	429 42	599 37	91 00	53 60	2,107 62	1,956 06
October	389 89	497 96	436 84	306 40	69 20		1,700 29	3,032 81
November	400 19	164 48	369 05	406 45	69 20		1,409 37	2,128 79
December	352 59	187 71	356 14	587 14	69 60	1 50	1,554 68	1,622 09
	$5,793 26	$3,776 20	$4,350 80	$5,694 75	$922 50	$70 05	$20,607 56	$25,232 37

The following is a statement of meters in use together with those on hand:

MAKE	½ inch	⅝ inch	¾ inch	1 inch	1¼ inch	1½ inch	2 inch	4 inch	Total
Crown	.....	.....	3	8	......	1	6	.....	18
Empire	.....	.....	1	1	.....	1	......	.....	3
Gem	.....	.....	......	......	......	......	......	2	2
Hersey......	.....	.....	5	7	1	......	5	1	19
Indicator....	.....	.....	......	......	......	......	1	.....	1
King........	.....	2	......	15	......	......	......	.....	17
Lambert	.....	3	......	......	......	......	1	.....	4
Nash........	.....	.....	......	1	......	......	......	.....	1
Neptune	.....	.....	15	......	......	......	3	.....	18
Thomson ..	.....	.....	2	2	......	1	1	.....	6
Union.......	2	.....	3	13	......	4	19	1	42
Worthington	.....	.....	......	7	......	.....	4	.....	11
Total....	2	5	29	54	1	7	40	4	142

Water Service.

Whole number put in to December 31, 1908.......	3,188
Number added in 1909	34
Total	3,222
Total number abandoned	66
Vacant services	56
Number remaining shut off for non-payment	5
Faucets locked	181
Faucets unlocked	165

NUMBER OF FIXTURES

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	T't'ls Jan. 1 1910	T't'ls Jan. 1 1909
Faucets	1,130	1,083	1,163	1,522	450	748	288	6,384	6,275
Bath Tubs	156	138	147	184	54	125	24	828	788
Water Closets	519	431	447	657	99	135	47	2,335	2,255
Hose Attachments	91	116	133	131	37	94	35	637	637
	1,896	1,768	1,890	2,494	640	1,102	394	10,184	9,955

STATEMENT OF INCOME FROM WATER RATES

	1905	1906	1907	1908	1909
Domestic Service	$37,921 78	$38,657 64	$40,933 70	$42,746 13	$42,568 19
Meter Service	7,721 71	8,458 82	10,454 94	10,046 42	11,359 51
Totals	$45,643 40	$47,116 46	$51,388 64	$52,792 55	$53,927 70
Abatements and Discount	510 78	465 73	4,675 06	4,809 49	5,140 41
Totals	$45,132 71	$45,650 73	$46,713 58	$47,893 06	$48,787 29

UNCOLLECTED WATER RATES.

Domestic Rates, 1907	$96 50
Domestic Rates, 1908	207 50
Domestic Rates	1,130 42
Meter Rates	403 78
	$1,838 20

WATER TAKERS

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	TOTALS	
								Jan. 1 1910	Jan. 1 1909
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	5	1	1	..	..	..	7	7
Bakehouses	..	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	.	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	12	..	..	13	12
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	433	491	483	495	243	405	196	2,746	2,727
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevator	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	2	..	1	2	1	7	7
Families	602	689	659	686	290	466	347	3,739	3,720
Foundries	..	1	..	..	1	..	..	2	2
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	4	..	1	9	9	14	38	36
Halls, Clubs, etc.	5	1	10	14	1	1	..	32	32
Hose and Fountains	90	115	132	129	36	94	32	628	628
Hospitals	1	..	..	..	..	..	..	1	0
Hotels	1	1	1	..	..	..	..	3	3
Hydrants	48	63	47	58	45	81	35	379	377
Irrigation	1	..	5	1	5	6	16	34	32
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	18	4	5	2	13	3	48	48
Motors	2	..	2	4	..	..	..	8	8
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	..	3	..	3	3
Public Library	..	..	1	..	..	1	..	2	2
Public Park	..	..	1	..	..	1	..	2	2
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	13	9	10	7	..	..	..	39	39
School Houses	5	1	2	3	5	2	2	20	20
Stables	50	75	50	24	58	44	31	332	330
Stores, Shops and Offices	24	42	58	190	11	12	3	340	338
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	7	..	1	1	18	18

WATER ANALYSES BY STATE BOARD OF HEALTH FOR 1909

(Parts in 100,000)

DATE OF		APPEARANCE			ODOR		RESIDUE ON EVAPORATION			AMMONIA				Chlorine	NITROGEN AS		Oxygen Consumed	Hardness	Iron
											Albuminoid								
Collection	Examination.	Turbidity	Sediment	Color	Cold	Hot	Total	Loss on Ignition	Fix'd	Free	Total	In Solution	In Suspension		Nitrates	Nitrites			
1909																			
Jan. 27	28	none	none	.02	none	none	10.80	......	......	.0058	.0032	......	......	1.43	.0220	.0000	......	5.4	.0000
Feb. 24	25	none	none	.00	none	none	11.20	......	......	.0060	.0038	......	......	1.36	.0240	.0000	......	4.9	.0010
Mar. 31	Apr. 1	none	none	.00	none	none	11.20	......	......	.0030	.0026	......	......	1.39	.0260	.0000	......	5.4	.0020
Apr. 28	28	none	none	.03	none	none	10.90	......	......	.0054	.0036	......	......	1.26	.0260	.0000	......	5.1	.0070
May 26	27	none	none	.00	none	none	10.40	......	......	.0064	.0028	......	......	1.21	.0200	.0001	......	5.1	.0090
June 30	July 1	none	none	.00	none	none	11.40	......	......	.0086	.0040	......	......	1.23	.0240	.0000	......	5.6	.0110
July 28	30	none	none	.10	none	none	9.00	......	......	.0006	.0026	......	......	1.03	.0180	.0000	......	3.9	.0040
Sept. 1	2	none	none	.00	none	none	10.00	......	......	.0018	.0044	......	......	1.23	.0090	.0000	......	4.6	.0020
Oct. 1	5	none	none	.00	none	none	9.70	......	......	.0034	.0042	......	......	1.23	.0110	.0001	......	4.4	.0030
Oct. 27	28	none	none	.00	none	none	9.00	......	......	.0016	.0036	......	......	1.17	.0070	.0000	......	3.9	.0030
Nov. 29	Dec. 1	none	none	.00	none	none	9.40	......	......	.0046	.0040	......	......	1.26	.0130	.0000	......	4.6	.0030
Dec. 29	30	none	none	.08	none	none	10.50	......	......	.0054	.0040	......	......	1.36	.0180	.0000	......	5.3	.0030

COAL CONSUMED AND DUTY OF PUMPING ENGINES

1909	Number of Hours Pumping	Pounds of Coal used Firing and Banking	Pounds of Coal used Pumping	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir	Average Height of Water in Pond above High Water Mark
January...	651	9,100	211,700	57,671,220	1,860,361.9	261	215	13	15.3
February..	405	14,000	188,600	55,905,718	1,996,632.7	275.9	217.4	15.4	26
March.....	351	21,300	192,900	53,768,032	1,734,452	251	217	15	26.6
April......	316¾	21,000	175,300	45,228,514	1,507,617	230.4	217.5	15.5	26
May†	440	18,400	209,900	52,310,940	1,606,804	229	215.1	13.1	26
June	410	18,200	204,200	53,770,980	1,792,366	241	216.2	14.2	25.8
July	344½	18,000	158,900	64,047,944	2,066,062.7	362	217.5	15.5	22.5
August....	297	15,900	121,500	59,350,600	1,914,535	431.9	218.3	16.3	18.9
September	424	18,900	208,400	52,575,886	1,752,529	231	216.7	14.7	14.5
October ...	520	6,800	187,500	57,890,318	1,867,429	297	217	15	15.5
November.	688½	800	214,100	52,393,678	1,746,455	244	215.4	13.4	15.4
December.	705½	2,000	231,800	55,491,414	1,790,045	237	216	14	28.4
Total....	5,553¼	164,400	2,304,800	660,405,244	1,809,329	267.4	216.5	14.6	21.7

† During this month 2,500,000 gallons were used cleaning and flushing reservoir and mains, making an actual average daily consumption of 1,606,804 gallons.

Gallons pumped, 1908....................	604,494,370
Gallons pumped, 1909....................	660,405,244
Coal consumed, 1908......................	1,182 13-20 tons
Coal consumed, 1909......................	1,234 12-20 tons

10% allowance has been made for slip.

SUMMARY OF STATISTICS

For Year Ending 1909.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

City of Woburn, Middlesex County, State of Massachusetts.

Population by Census of 1905, 14,400.
Date of construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery near Horn Pond.
Mode of supply, pumping direct and to reservoir.

Pumping.

1. Builders of pumping machinery, Worthington & Blake.
2. Description of fuel used, (a) kind, bituminous coal; (b) brand of coal; (c) average price of coal per gross ton, delivered, $4.92; (d) percentage of ash, 9; (e) wood, price per cord, none used.
3. Coal consumed for the year, 2,469,200 pounds.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 660,405,240 gallons, with 10 per cent. allowance for slip.
7. Average static head against which pumps work, 213.5 feet.
8. Average dynamic head against which pumps work, 216.5 feet.
9. Number of gallons pumped per pound of equivalent coal (3), 267.4.
10. Duty equals gallons pumped (6) times 8.34 (lbs.) times

100 times dynamic head (8) divided by total fuel consumed (3). Equals 48,292,334.

Cost of pumping, figured on pumping station expenses, viz., $10,045.55.

11. Per million gallons, $15.22.
12. Per million gallons raised one foot (dynamic), $0.07.

Cost of pumping, figured on total maintenance, viz., $20,607.56.

13. Per million gallons pumped, $31.22.
14. Per million gallons raised one foot (dynamic), $0.144.

FINANCIAL.

Maintenance.

Receipts.

From Consumers:		
A. Water rates, fixture	$41,788 19	
B. Water rates, meter	$11,359 51	
C. Net receipts for water (A) plus (B)	$53,147 70	
D. Miscellaneous (rent, repairs, sales, etc.)........	1,140 82	
	$54,288 52	
D2. Discount and abatements..	5,140 41	
E. Total from consumers		$49,148 11
From Public Funds:		
F. Hydrants		
G. Fountains	$275 00	
H. Street waterings	250 00	
I. Public buildings	255 00	
J. General appropriations		
Total from Public Funds..		780 00
K. Gross receipts from all sources		$49,928 11

Expenditures.

AA.	Management and repairs..	$20,607 56	
BB.	Interest on bonds........	2,780 00	
CC.	Total maintenance for year		$23,387 56
DD.	Transfer to Service Construction account ...		757 71
DDD.	Balance transferred to Sinking Fund		25,782 84
K.	Total		$49,928 11

Consumption.

1. Estimated total population at date, 14,400.
2. Estimated population on line of pipe, 14,300.
3. Estimated population supplied, 14,300.
4. Total consumption for the year, 660,405,240 gallons.
5. Passed through meters, 79,573,950.
6. Percentage of consumption metered, .12.
7. Average daily consumption, 1,809,329.
8. Gallons per day to each inhabitant, 125.64.

Distribution.

Mains.

1. Kind of pipe, cement and cast iron.
2. Sizes, from 4-inch to 14-inch.
3. Extended during the year, 1,172 feet.
4. Discontinued, —— feet during the year.
5. Total now in use, 57.43 miles.
6. Cost of repairs per mile, $35.24.
7. Number of leaks per mile, 2.12.
8. Length of pipes less than 4 inches diam., 5.81 miles.
9. Number of hydrants added during year (public and private), 2.

10. Number of hydrants (public and private) now in use, 382.
11. Number of stop gates added during the year, 9.
12. Number of stop gates now in use, 455.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow-off gates, 17.
15. Range of pressure on mains at centre of city, 70 pounds to 75 pounds.

Services.

16. Kind of pipe, lead lined, cement lined and galvanized.
17. Sizes, 1-inch.
18. Extended, —— feet.
19. Discontinued, —— feet.
20. Total now in use, —— miles.
21. Number of service taps added during year, 34.
22. Number now in use, 3,222.
23. Average length of service, —— feet.
24. Average cost of service, $30.39.
25. Number of meters added, 12.
26. Number now in use, 87.
27. Percentage of service metered, .027.
28. Percentage of receipts from metered water (B divided by K), .227.
29. Number of motors and elevators added.
30. Number now in use, 10.

Respectfully submitted,

REDMOND E. WALSH,

Water Registrar.

ENGINEERING DEPARTMENT.

1910

ANNUAL REPORT

OF THE

WATER DEPARTMENT

OF THE

CITY OF WOBURN

FOR THE YEAR 1910

THE NEWS PRINT, WOBURN, MASS.
1911

ANNUAL REPORT

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1911

REPORT OF COMMISSIONER OF WATER AND WATER SUPPLY

To the Board of Public Works:

I herewith submit my annual report as Water Commissioner for the year 1910. The appended report of the Superintendent covers the general work done and such recommendations as, in his opinion, are necessary for the maintenance of this department. It also shows the number of streets on which the old cement-lined pipe has been replaced with cast-iron pipe during the past year, many of which old pipes have been a constant source of trouble to the department and inconvenience to the water consumers in their vicinity from the constantly occurring breaks.

The new Platt pump at the Pumping Station has not yet passed the duty trial test, although it has been in continuous operation and has pumped all the water used since April 1st, with the exception of one and one-half days,—on one of which the reservoir was being cleaned and it was thought advisable to use the old pumps, and another half day when the pump was shut down for adjustment. It has been necessary to keep this pump in operation every day since early summer, because the old pumps could not draft water from the elevation to which the ground water had been lowered, and the old pumps have, as a result, been out of commission since the latter part of June when the old filter gallery from which these pumps take their supply ran practically dry and has remained so ever since. This condition was caused by the long dry season and large water consumption which is shown by the report of the Engineer. Had the Platt pump become disabled from any cause during this time it would have been necessary to supply the city with pond water. As these conditions are liable to continue or recur at any time it will be necessary in order to avoid the use of pond water to install an auxiliary pump, set at a sufficiently low level to take its supply from the new well which is about ten feet lower than the old filter gallery. A medium-priced pumping engine of the compound, duplex direct action type would fulfill that requirement, and, by removing one or both of the old pumps, it could be installed without any expense for a new building at a cost of approximately $12,000. This I think is a matter of very great importance and should be considered at the earliest opportunity. The additional supply from the driven wells at the westerly side of the pond was adequate until the latter part of the season when the ground water at the side of these wells was lowered by the siphon line to an elevation so near that of the water in pump well that but little water could be obtained.

A new boiler of modern construction has been installed during the past year to replace one that has been in service for twenty-four years and outlived its usefulness.

As a matter of great importance it is my duty to call your attention to the increasing consumption of water which in 1910 averaged two million one hundred and fifty thousand (2,150,000) gallons per day, or seventeen (17) per cent. increase over the preceding year. At the last session of the Legislature application was made for a right to issue one hundred thousand dollars ($100,000) for the improvement of the distribution system. The Legislature, however, so amended the bill that but twenty thousand dollars ($20,000) was available in 1910 for this reconstruction. Nineteen thousand, three hundred and twenty-two dollars and forty-nine cents ($19,322.49) were spent this year, but despite this work the consumption increased. It is apparent, therefore, that the limit established by the Legislature will not make possible a replacement of mains sufficiently rapid to keep step with the increasing consumption and will not result in conserving the supply so as to keep within the limits of the capacity of the source. I therefore recommend that active steps be taken to make possible the expenditure of one hundred thousand dollars ($100,000) during the present year.

The advisability of metering all services may be open to some question owing to the disturbing effects on meters of breaks in the old mains, but in view of the absolute necessity of adopting every possible means of reducing consumption—in order that the present source may be capable of supplying the city—I recommend the immediate installation of meters on all services.

Furthermore, I beg to call your attention to the recommendations of our Engineer, Mr. F. A. Barbour, regarding the suggestion of a means by which water, in cases of emergency drawn from Horn Pond, may be purified before delivery to consumers by passage through a percolating area constructed adjacent to the driven wells. Since it is hardly possible that by the replacement of mains and the installation of meters the consumption can be checked quickly enough to keep within the capacity of the supply during the next two years this possible means of obtaining at a relative small cost additional water of suitable quality merits your earnest consideration.

Respectfully submitted,

WM. H. CONWAY,

Commissioner of Water and Water Supply.

REPORT OF SUPERINTENDENT OF WATER DEPARTMENT FOR 1910

Woburn, Mass., December 31, 1910.

To the Commissioner of Water and Water Supply:

Sir:—Following the custom of previous years, I present the following report upon the condition of the work and operation of the department for the year ending December 31, 1910. I have endeavored to be as concise as possible in giving a record of the work done by the department in the following report:

We commenced the relaying of our main pipe on August 16th. This work was continued until late in the "fall," when the weather conditions prevented further work of this nature. The following table will show the length and size of pipe laid, and the size of pipe that was replaced.

Streets	Length	Size of pipe laid	Size of pipe replaced
Hudson	550 ft.	6 in. cast iron	4 in. cement
Bennett	436 "	6 " " "	4 " "
Montvale Ave..	2,039 "	12 " " "	10 & 6 " "
Montvale Ave..	711 "	10 " " "	6 " "
Montvale Ave..	26 "	6 " " "	6 " "
Mt. Pleasant...	1,092 "	6 " " "	4 " "
Arlington	925 "	6 " " "	4 " "
Highland	473 "	6 " " "	4 " "
Albany	565 "	6 " " "	4 " "
Munroe	321 "	10 " " "	4 " "
Munroe	23 "	6 " " "	4 " "
No. Warren ..	1,320 "	10 " " "	4 " "

In addition to the above, we replaced the ¾-inch temporary main on Utica street, with 387 feet of 2-inch, and installed a fire service to the car barns, off Harrison avenue, which required the laying of 300 feet of 6-inch cast-iron pipe. We also laid 38 feet of 6-inch cast-iron pipe to the brass foundry on Montvale avenue, for fire service. The relaying of the main pipe on North Warren street is a great improvement to our system, as it increases the volume of water, in addition to giving the residents in that locality better protection in case of fire. In connection with the work of relaying our mains on the above streets, we have also installed gates and made connections to the adjoining streets, which will facilitate further work of this nature on the streets.

Repairs on Mains.

We had ninety-one breaks on our main pipe. Of these thirty-nine were on 4-inch, forty-four on 6-inch, one on 8-inch, four on 10-inch, one on 12-inch, and two were on 14-inch. Of the above, nineteen were caused by lightning, fifty-two by thin lining, three closing of hydrants, four by pipe settling, five were joint leaks, three by rust, one by blasting, and four by back pressure from the B. & N. St. R. R. power station.

Services.

There were thirty-eight new services laid. Repairs were necessary upon 332. Of these, seventeen were renewed, sixty-two required cleaning, one hundred and forty-seven were shut off for repairs, and general repairs were made on one hundred and six.

Service Boxes.

Number of new service boxes were fifty-seven, twenty-one excavated and reset, nineteen required repairing, nineteen were replaced with new ones, eighty-seven raised to grade and two hundred and twenty-five were lowered.

Gates.

In connection with the relaying of the main pipe on Montvale avenue we added three 12-inch gates and one 10-inch to our system. It was also necessary to replace thirteen with new ones on this line and on the intersecting streets. On Albany street we added one 6-inch and replaced one. There were two 6-inch installed to take the place of two 4-inch on Mt. Pleasant street. One 6-inch was added on Highland street and one was replaced. A 6-inch was replaced on Hudson street, and one was added on Munroe, Merrimac and Bennett streets. One was also replaced on the Bennett street main. Two 4-inch were added on Fowle and Franklin streets. On the North Warren street line of pipe and on intersecting streets we added one 10-inch and four 6-inch gates. There were nine gate boxes replaced with new. Eight were dug up and reset. Repairs were made on six gates and four were dug up and packed.

Hydrants.

During the progress of the season's work we added one to our system. Repairs were made on thirteen. Nineteen old hydrants were replaced with those of a modern make, as recommended in my former reports. The usual examinations have been made, and they are all in good working condition.

Meters.

The total number of meters now in use, ninety-one. Sixteen were replaced, three being replaced with a larger size. Fourteen required minor repairs.

Street Watering Standpipes.

There are now sixteen in use, two being installed the past year.

Pumping Station and Grounds.

The grounds have received their usual attention and care. I would recommend that the grading of the grounds adjoining the station be continued.

Shops.

We have experienced many difficulties from lack of space in our repair shop on Winn street. At present we rent a building for storage purposes. I renew my suggestion of past years, that the city secure more suitable quarters for the department.

Reservoir.

The reservoir received its usual cleaning. The bottom and side walls should be concreted. This work would require the blasting of the bottom, and the cutting off of a portion of the back.

Stable.

We now have three horses, one having been purchased during the year. I would recommend the purchasing of a horse to replace one which is too light for our work. We are also in need of two wagons, one for general purposes and one for hauling pipe.

Recommendations.

The ground wires of the New England Telephone Company and Edison Electric Light Company should be removed from our service pipes. These wires serve to conduct the lightening to our mains. The wires of the Edison Company are sometimes "charged," which serves to weaken our pipe. In the relaying of our mains, I would recommend that the pipe be laid as great a distance as possible from the street railway track location. We should have a systematic inspection of all premises supplied with water, and the restriction of all preventable wastes. This method would mean additional expense, however. I believe it would greatly aid in the cutting down of the wasteful use of water. In closing I desire to call your attention to the following list of streets where improvements are needed at once:

Street	Size of pipe now in use	Size of pipe Recommended
Nichols	4 inch	6 inch
Poole	4 "	6 "
Harrison Ave.	4 "	6 "
Morse	4 "	6 "
Garfield Ave.	4 "	8 "
Carter	4 "	6 "
Lexington—6,200 ft.	0 "	6 "
Federal	2½ "	6 "
Park	1 "	6 "
Thorn	1 "	6 "
Auburn—200 ft.	4 "	6 "
Montvale Ave.	10 "	12 "
Winn	6 "	6 "
Broad—572 ft.	1 "	6 "

Of the above, my reason for recommending Broad, Winn and Auburn streets is for the purpose of eliminating dead ends, which should not exist on our system.

I recommend the laying of the Lexington street main as a benefit to our system on that side of the city. At present the water on Cambridge street is dependent upon the Bedford street main, and whenever a break occurs on Bedford street beyond South Bedford street this whole section has to be shut off. When repairs are necessary it takes two men one-half day to notify water-takers that the water will be shut off, and in the spring and summer, when the market gardeners are busy setting out small plants, the delay is liable to cause them considerable loss, besides depriving them for the time being of fire protection. By putting in this main we would have a good circulation of water and additional pressure for fire purposes.

Respectfully submitted,

ROBERT T. SPENCER,

Superintendent.

REPORT OF WATER REGISTRAR
FOR YEAR 1910

Woburn, Mass., December 31, 1910.

To the Commissioner of Water and Water Supply:

Sir:—I have the honor to submit the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1910.

REVENUE AND EXPENDITURES.

Auxiliary Supply.

Overdrawn January 1, 1910.........	$5,130 38
Transfer from Maintenance Account.	2,691 75
Overdrawn January 1, 1911.........	$2,438 63

New Pump and Pumping Station Addition.

Balance January 1, 1910............	$10,344 25

New Well.

Receipts.

Transfer from Maintenance Account.	$2,506 88

Expended.

Overdraft 1909	$2,506 88

Relaying Mains.

Receipts.

Appropriation	$20,000 00	
Transfer from Maintenance Account.	1,590 79	
		$21,590 79

Expended.

Overdraft 1909	$1,590 79	
Labor and material	19,322 49	
		$20,913 28
Balance January 1, 1911		$677 51

Service Construction.

Receipts.

Labor and material	$690 09	
Transfer from Maintenance Account	545 23	
		$1,235 32

Expended.

Services		$1,235 32

Cost of Water Works to December 31, 1909		$623,156 43
Construction for year ending December 31, 1910, less amount turned into City Treasury	$545 23	
Cost auxiliary supply	15,130 38	
Cost new well	12,506 88	
		28,182 49
		$651,338 92

MAINTENANCE.

Revenue.

Water Rate Collections:		
1908 Account—		
Domestic rates	$9 00	
Fines	75	
		$9 75
1909 Account—		
Domestic rates	$854 49	
Fines	19 50	
Meter rates	79 93	
		953 92

1910 Account—

Domestic rates		$43,165 64	
Fines		75 25	
Seals		23 25	
Fractional rates		369 07	
Meter rates		11,652 69	
		$55,285 90	
Discounts	$5,054 05		
Abatements	201 60		
		$5,255 65	
			50,030 25
Sundry receipts (repairs, etc.)			520 70
Total collections 1910			$51,514 62

Expenditures.

Maintenance:

Expressing	$18 51
Miscellaneous	391 70
Miscellaneous labor	1,496 21
New horse	304 00
New meters	200 00
New pung	65 00
Repairs to drinking fountains	48 35
" " gates	45 06
" " hydrants	288 62
" " meters and meterpits	276 55
" " services	1,591 35
" " standpipes	76 08
" " street mains	1,460 75
" " wagons	124 30
Reservoir (cleaning, etc.)	36 50
Salary (Superintendent)	1,200 00
Sharpening picks, bars, etc.	27 10

Stable	601 62	
Supplies	359 58	
Telephones	73 54	
		$8,684 82
Pumping Station:		
Care of grounds	$152 00	
Express	9 25	
Fuel	4,816 72	
Lighting	69 60	
Miscellaneous	64 46	
Oil, waste and packing	341 32	
New boiler	790 00	
Setting new boiler and removing old one	560 85	
Connecting new boiler	523 55	
Grates for new boiler	180 00	
Rental of pump	182 50	
Repairs to boilers	222 78	
Repairs to pumps	194 61	
Salaries	3,925 64	
Supplies	98 42	
Telephone	37 39	
		12,169 09
Office:		
Salaries	$1,022 30	
Supplies	37 93	
		1,060 23
Total expenditures, 1910		$21,914 14
Interest on Water Debt		3,010 00
Transfer to Auxiliary Supply Account		2,691 75
" " New Well Account		2,506 88
" " Relaying Mains Account		1,590 79
" " Service Construction Account		545 23
" " Sinking Fund		19,255 83
		$51,514 62

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1910 INCLUSIVE.

Year	No. Services	Receipts	EXPENDITURES Maintenance	Interest	Total	Surplus
1872	.....	....	....	$6,165 76	$6,165 76	‡$6,175 76
1873	498	$4,600 00	$4,976 99	11,424 37	16,401 36	‡11,801 36
1874	734	16,755 30	9,457 28	20,329 50	29,786 79	‡13,041 49
1875	835	17,117 25	7,166 44	24,500 00	31,666 34	‡14,549 29
1876	992	19,886 96	8,603 84	24,500 00	33,103 84	‡13,216 98
1877	1,084	22,508 03	6,848 84	25,108 59	31,957 43	‡9,449 40
1878	1,208	23,975 08	7,393 30	25,125 00	32,518 30	‡8,543 22
1879	1,290	24,060 29	7,527 40	25,798 60	33,326 00	‡8,165 71
1880	1,361	25,793 61	10,336 61	26,441 00	37,777 61	‡10,984 00
1881	1,413	27,608 62	8,291 00	26,741 00	35,032 00	‡7,423 38
1882	1,487	27,447 84	9,877 59	26,041 00	36,918 59	‡9,470 75
1883	1,559	29,925 52	9,276 27	27,041 00	36,317 27	‡6,391 75
1884	1,627	30,010 77	7,691 76	27,041 00	34,732 76	‡4,721 99
1885	1,730	30,999 51	8,974 37	27,041 00	36,016 37	‡5,015 86
1886	1,844	32,654 27	10,292 99	27,397 13	37,690 12	‡5,085 85
1887	1,966	34,266 65	†13,326 90	27,073 50	40,400 40	‡6,133 75
1888	2,061	34,002 02	10,697 99	16,982 50	27,680 40	6,321 53
1889	2,154	36,534 03	11,134 84	26,035 56	37,170 49	‡646 37
1890	2,233	37,944 36	12,351 11	25,306 75	37,657 86	336 50
1891	2,302	37,756 57	13,049 45	24,577 75	37,627 20	129 37
1892	2,369	37,405 88	11,033 61	24,483 75	35,517 36	2,888 52
1893	2,464	41,106 00	15,980 64	17,692 58	33,673 22	7,432 78
1894	2,559	42,528 48	12,629 09	12,985 75	25,614 84	17,913 64
1895	2,628	44,828 39	13,241 98	11,271 75	24,513 73	20,313 66
1896	2,709	45,750 29	20,671 20	10,070 00	30,741 20	15,009 09
1897	2,773	47,634 56	19,407 23	8,936 00	28,343 23	19,291 33
1898	2,821	48,013 24	11,164 80	7,812 00	18,976 80	29,036 44
1899	2,869	48,096 26	10,748 75	6,626 08	18,374 75	30,721 41
1900	2,894	§44,201 44	13,450 68	5,725 38	19,176 06	25,025 38
1901	2,925	‖42,814 87	11,627 99	4,774 00	26,402 09	26,412 88
1902	2,962	‖42,857 58	13,251 55	3,676 00	16,927 55	25,930 03
1903	2,996	‖47,616 21	13,995 10	2,660 00	16,655 10	30,961 11
1904	3,021	**‖46,742 19	16,916 60	1,652 00	18,568 50	28,173 59
1905	3,057	**‖45,921 42	16,507 14	608 00	17,115 14	28,806 28
1906	3,111	**‖47,619 72	16,661 32	64 00	16,725 32	30,894 40
1907	3,151	**‖48,115 45	19,265 04	410 00	19,675 04	28,440 41
1908	3,188	**‖51,134 04	25,232 27	508 10	25,740 47	25,393 57
1909	3,222	**‖49,928 11	20,607 56	2,780 00	23,387 56	26,540 55
1910	3,250	**‖51,514 62	21,914 14	3,010 00	24,924 14	26,590 48
		$1,388,715 43	$481,581 77	$597,416 32	$1,078,998 09	$454,718 58

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*Ten months.

†In this amount is included $1,000 transferred to Construction account.

‡Deficiency.

§Appropriation for hydrant service reduced from $5,050 to $1,730.

‖No appropriation for hydrant service.

**Water rates on schools amounting to $537 not paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita for domestic and other purposes.

WATER PUMPED				CONSUMPTION PER CAPITA			
				Annually		Daily	
Year	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes‖ Gallons	For all Purposes Gallons	Domestic Purposes Gallons	For all Purposes Gallons
†1873-74	99,522,564	....	99,522,564	*10,625.94	*10,625.94	70.47	70.47
1874-75	228,114,068	13,946,060	242,060,128	28,841.35	25,298.92	65.31	69.31
1875-76	253,070,098	13,573,566	266,643,664	25,718.55	27,026.78	70.46	74.04
1876-77	225,350,577	18,775,415	244,125,992	32,285.46	24,142.20	61,05	66.14
1877-78	162,523,918	24,843,325	187,367,243	15,649.94	18,070.90	42.87	49.51
1878-79	202,212,585	30,414,959	237,627,544	19,535.80	22,295.69	53.52	61.08
1879-80	226,167,598	41,671,685	267,839,283	20,691.39	34,502.72	56.68	67.13
1880-81	239,085,793	30,460,765	269,546,558	21,550.90	24,296.60	59.04	66.56
1881-82	250,489,800	31,505,186	281,994,986	22,249.93	24,988.47	60.96	68.46
1882-83	269,660,902	31,566,923	301,227,825	23,609.20	26,372.59	54.68	72.25
1883-84	214,940,593	37,978,384	252,918,977	18,551.75	21,829.70	50.82	59.80
1884-85	187,874,878	43,341,199	231,216,977	15,989.35	19,667.96	43.80	53.91
1885-86	218,303,505	33,042,819	251,346,324	18,043.10	20,774.14	49.43	56.91
1886-87	312,407,520	22,012,063	344,419,580	25,094.98	26,863.16	68.75	73.59
1887-88	285,924,528	38,363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
†1888...	193,639,657	41,854,103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889...	219,416,786	36,125,854	253,542,590	16,686.95	19,282.27	45.71	62.82
1890...	241,052,891	42,752,509	293,805,400	18,597.88	21,764.97	50.95	59.63
1891...	241,450,716	39,370,734	280,821,050	17,709.45	20,596.40	48.51	56.42
1892...	248,856,570	43,719,280	292,575,850	18,072.37	21,247.33	49.51	58.21
1893...	284,481,937	53,434,313	337,916,250	20,457.49	24,300.03	56.04	66.57
1894...	313,450,904	57,566,396	361,017,300	22,322.38	25,709.82	61.15	70.43
1895...	317,570,332	67,951,868	385,522,200	22,398.81	27,191.57	61.36	74.49
1896...	324,880,999	50,586,401	375,467,400	22,786.01	26,333.80	62.46	72.14
1897...	309,634,781	57,696,169	367,330,950	21,595.43	25,619.39	59.16	70.19
1898...	314,896,516	48,127,334	363,023,850	21,839.00	25,176.76	59.83	68.97
1899...	358,980,560	46,048,540	405,029,100	24,757.28	27,933.04	67.83	76.53
1900...	374,963,730	42,572,170	417,435,900	26,298.84	29,285.52	72.05	80.23
1901...	380,420,649	46,217,451	426,638,100	26,602.84	29,834.83	72.88	81.74
1902...	403,426,680	41,255,670	444,682,350	28,310.64	31,205.78	77.56	85.49
1903...	433,632,792	69,364,458	502,997,250	30,537.52	35,422.34	83.66	97.04
1904...	453,058,373	67,226,077	520,284,450	31,793.57	36,511.18	87.10	100.03
1905...	480,566,720	63,240,630	543,807,350	33,372.61	37,764.40	91.42	103.46
1906...	492,138,200	60,243,700	552,381,900	34,176.26	38,359.85	93.63	105.09
1907...	535,950,900	77,840,250	613,791,150	37,218.31	42,624.38	101.96	116.77
1908...	523,207,190	81,287,180	604,494,370	36,333.83	41,978.77	99.24	114.69
‖1909...	580,831,290	79,573,950	660,405,240	40,335.50	45,861.47	110.50	125.64
§1910...	680,602,921	98,386,635	778,989,556	44,483.19	50,914.35	121.87	139.22

§1½ per cent. allowance for slip.

†Five months. ‡Ten months. *Five months. ‖ 10% allowance for slip

NUMBER OF FIXTURES.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals Jan. 1 1911	Totals Jan. 1 1910
Faucets	1,159	1,142	1,180	1,541	460	778	297	6,557	6,384
Bath Tubs	169	156	152	189	61	137	26	890	828
Water Closets	532	449	475	668	108	155	51	2,438	2,335
Hose Attachments.	92	116	133	132	37	94	35	639	637
	1,952	1,863	1,940	2,530	666	1,164	409	10,524	10,184

STATEMENT OF INCOME FROM WATER RATES.

	1906	1907	1908	1909	1910
Domestic Service	$38,657 64	$40,933 70	$42,746 13	$42,568 19	$44,516 95
Meter Service ...	8,458 82	10,454 94	10,046 42	11,359 51	11,732 62
Totals	$47,116 46	$51,388 64	$52,792 55	$53,927 70	$56,249 57
Abatements and Discount	465 73	4,675 06	4,899 49	5,140 41	5,255 65
Totals	$45,650 73	$46,713 58	$47,893 06	$48,787 29	$50,993 92

Uncollected Water Rates.

Domestic rates, 1907	$70 00
Domestic rates, 1908	147 50
Domestic rates, 1909	222 00
Domestic rates, 1910	751 75
Meter rates	246 95
	$1,438 20

WATER TAKERS.

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	TOTALS Jan. 1 1910	TOTALS Jan. 1 1911
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	5	1	1	..	..	..	7	7
Bakehouses	1	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	15	..	..	13	16
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	437	493	488	496	246	413	197	2,746	2,770
Electric Light Station	1	..	..	..	..	..	..	1	1
Elevator	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	2	..	1	2	1	7	7
Families	607	703	665	687	293	474	348	3,739	3,777
Foundries	..	2	..	..	1	..	..	3	3
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	4	..	1	9	10	14	38	39
Halls, Clubs, etc.	5	1	10	14	1	1	..	32	32
Hose and Fountains	91	115	132	130	36	94	32	628	630
Hospitals	1	..	..	..	..	..	..	1	1
Hotels	1	1	1	..	..	..	..	3	3
Hydrants	48	63	47	58	45	81	35	379	377
Irrigation	1	..	5	1	5	6	16	34	34
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	19	4	5	2	13	3	48	49
Motors	2	..	2	4	..	..	..	8	8
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	1	3	..	3	4
Public Library	..	..	1	..	..	1	..	2	2
Public Park	1	..	1	..	..	1	..	2	3
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	14	9	10	7	..	..	..	39	40
School Houses	5	1	2	3	5	2	2	20	20
Stables	50	75	50	24	58	44	31	332	332
Stores, Shops and Offices	24	42	58	190	11	12	3	340	340
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	9	..	1	1	18	20

STATEMENT OF EXPENSES BY MONTHS

MONTHS	MAINTENANCE		PUMPING STATION		OFFICE		TOTALS	
	Pay Rolls	Supplies	Pay Rolls	Supplies	Pay Rolls	Supplies	1910	1909
January	$575 40	$253 96	$471 37	$1,022 83	$88 00	$12 00	$2,423 56	$1,578 32
February	358 30	133 39	384 30	685 76	69 20	....	1,630 95	1,103 36
March	332 03	124 02	330 63	483 94	72 20	4 85	1,347 67	2,014 60
April	513 45	99 89	355 52	488 53	91 75	....	1,549 14	1,962 38
May	349 29	321 01	311 12	417 23	69 20	....	1,467 85	1,707 41
June	432 24	791 85	406 79	271 80	94 20	....	1,996 88	1,684 63
July	803 08	146 99	346 64	226 60	84 60	....	1,607 91	2,189 17
August	435 52	245 96	343 21	512 99	84 60	....	1,622 28	1 595 73
September	355 86	329 84	295 95	164 87	84 60	8 00	1,239 12	2,107 62
October	401 61	240 48	272 08	322 36	93 60	....	1,330 13	1,700 29
November	588 91	175 61	409 75	2,343 09	105 75	6 58	3,629 69	1,409 37
December	462 65	213 48	361 51	940 22	84 60	6 50	2,068 96	1,554 68
	$5,608 34	$3,076 48	$4,288 87	$7,880 22	$1,022 30	$37 93	$21,914 14	$20,607 56

The following is a statement of meters in use together with those on hand:

MAKE	½ inch	⅝ inch	¾ inch	1 inch	1¼ inch	1½ inch	2 inch	4 inch	Total
Crown			3	8		1	6		18
Empire			1	1		1			3
Gem								2	2
Hersey			5	7	1		5	1	19
Indicator							1		1
King		2		15					17
Lambert		3					1		4
Nash				1					1
Neptune			15				3		18
Thomson			2	2		1	1		6
Union	2		3	13		4	19	2	43
Worthington				7			4		11
Total	2	5	29	54	1	7	40	5	143

Water Service.

Whole number put in to December 31, 1909	3,222
Number added in 1910	38
Total	3,260
Total number abandoned	67
Vacant services	56
Number remaining shut off for non-payment	5
Faucets locked	128
Faucets unlocked	101

COAL CONSUMED AND DUTY OF PUMPING ENGINES.

1910	Number of Hours Pumping	Pounds of Coal used Firing and Banking	Pounds of Coal used Pumping	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir in feet	Average Height of Water in inches in Pond above High Water Mark
									Above
January...	742	....	272,500	60,374,226	1,947,555.6	221	217.5	11.6	30.2
February..	672	....	273,900	56,621,532	2,022,197	206	218	12	31.6
March.....	523¾	6,700	206,600	61,944,310	1,998,203.5	290	221.3	15.3	28.8
April†.....	294¾	15,400	122,800	56,325,282	1,827,509	396	224	16	28.5
May.......	302¼	16,000	120,900	61,636,082	1,988,260	450	226	17	28.5
June.......	307½	15,400	127,000	64,494,340	2,149,811	452	226.3	17.3	28.7
July.......	379¾	16,400	150,800	81,802,090	2,638,777	489	227.7	16.7	19
August....	349	16,400	140,800	73,198,270	2,361,234.5	465	228.5	16	6.5
									Below
September	321½	15,000	129,500	67,306,068	2,243,535	465	230.9	16.4	1.5
October...	344½	16,800	135,200	70,257,104	2,266.358	462	230	15	11.5
November.	326¼	15,000	128,100	62,488,762	2,082,958.7	486	230.9	15.4	13.7
December.	321½	15,500	130,300	62,541,490	2,017,467	428	231.5	15.8	15.1
Total....	4884¾	148,600	1,938,400	778,989,556	2,130,108	373	226.05	15.3	13.3

† During this month 1,500,000 gallons were used cleaning reservoir and flushing mains, making an actual average daily consumption of 1,827,509 gallons.

Gallons pumped 1909	660,405,244
Gallons pumped 1910	778,989,556
Coal consumed 1909	1,234 12-20 tons
Coal consumed 1910	1,043 10-20 tons

Ten per cent. allowance has been made for slip of old pumps.

One and one-half per cent. allowance has been made for slip of new pump.

From January 1 to August 31 average height of pond was 25.2 in. above high-water mark.

From September 1 to December 31 average height of pond was 10.4 in. below high-water mark.

SUMMARY OF STATISTICS

For Year Ending 1910.

In form recommeded by the New England Water Works Association.

WOBURN WATER WORKS.

City of Woburn, Middlesex County, State of Massachusetts.
Population by Census of 1910, 15,308.
Date of construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery and Tubular Wells, near Horn Pond.
Mode of supply, pumping direct and to reservoir.

Pumping.

1. Builders of pumping machinery, Platt Iron Works and Worthington & Blake.
2. Description of fuel used: (a) kind, bituminous coal; (b) brand of coal, Pocahontas; (c) average price of coal per gross ton, delivered, $4.35; (d) percentage of ash, 9; (e) wood, price per cord, none used.
3. Coal consumed for the year, 2,087,000 pounds.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 778,989,556 gallons, with 1½ per cent. allowance for slip.

7 Average static head against which pumps work, 222.05 feet.

8. Average dynamic head against which pumps work, 226.05 feet.

9. Number of gallons pumped per pound of equivalent coal (3), 373.

10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (3). Equals, 70,368,735.

Cost of pumping, figured on pumping station expenses, viz., $12,169.09.

11. Per million gallons, $15.62.

12. Per million gallons raised one foot (dynamic), $0.06.

Cost of pumping, figured on total maintenance, viz., $21,914.14.

13. Per million gallons pumped, $28.13.

14. Per million gallons raised one foot (dynamic), $0.124.

FINANCIAL.

Maintenance.

Receipts.

From Consumers:			
A.	Water rates, fixture	$43,736 95	
B.	Water rates, meter	11,732 62	
C.	Net receipts for water (A) plus (B)	$55,469 57	
D.	Miscellaneous (rent, repairs, sales, etc.)	520 70	
		$55,990 27	
D2.	Discount and abatements	5,255 65	
E.	Total from consumers		$50,734 62
From Public Funds:			
F.	Hydrants		
G.	Fountains	$275 00	

H.	Street waterings	250 00	
I.	Public buildings	255 00	
J.	General appropriations		
	Total from Public Funds		780 00
K.	Gross receipts from all sources		$51,514 62

Expenditures.

AA.	Management and repairs	$21,914 14	
BB.	Interest on bonds	3,010 00	
CC.	Total maintenance for year		$24,924 14
DD.	Transfer to Relaying Mains Account	$1,590 79	
EE.	Transfer to Auxiliary Supply Account	2,691 75	
FF.	Transfer to New Well Account	2,506 88	
GG.	Transfer to Service Construction Account	545 23	
HH.	Balance transferred to Sinking Fund	19,255 83	
K.	Total		$51,514 62

Consumption.

1. Estimated total population at date, 15,308.
2. Estimated population on line of pipe, 15,200.
3. Estimated population supplied, 15,200.
4. Total consumption for the year, 778,989,556 gallons.
5. Passed through meters, 98,386,635.
6. Percentage of consumption metered, .126.
7. Average daily consumption, 2,130,108.
8. Gallons per day to each inhabitant, 139.22.

Distribution.

Mains.

1. Kind of pipe, cement and cast iron.
2. Sizes, from 4-inch to 14-inch.
3. Extended during the year——feet.
4. Discontinued,—— feet during the year.
5. Total now in use, 57.43 miles.
6. Cost of repairs per mile, $25.43.
7. Number of leaks per mile, 1.8.
8. Length of pipes less than 4 inches diam., 5.81 miles.
9. Number of hydrants added during year (public and private), 2.
10. Number of hydrants (public and private) now in use, 384.
11. Number of stop gates added during the year, 16.
12. Number of stop gates now in use, 471.
13. Number of stop gates smaller than 4-inch, 55.
14. Number of blow-off gates, 17.
15. Range of pressure on mains at centre of city, 70 pounds to 75 pounds.

Services.

16. Kind of pipe, lead lined, cement lined and galvanized.
17. Sizes, 1-inch.
18. Extended, —— feet.
19. Discontinued, —— feet.
20. Total now in use, —— miles.
21. Number of service taps added during year, 38.
22. Number now in use, 3,260.
23. Average length of service, —— feet.
24. Average cost of service, $32.50.
25. Number of meters added, 7.
26. Number now in use, 94.
27. Percentage of service metered, .028.

28. Percentage of receipts from metered water (B divided by K), .227.
29. Number of motors and elevators added.
30. Number now in use, 10.

Respectfully submitted,

REDMOND E. WALSH,

Water Registrar.

MASS. STATE BOARD OF HEALTH,
ENGINEERING DEPARTMENT

1911

1911

ANNUAL REPORT

OF THE

WATER DEPARTMENT

OF THE

CITY OF WOBURN

FOR THE YEAR 1911

THE NEWS PRINT, WOBURN, MASS
1912

ANNUAL REPORT

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For the Year Ending 1911

THE NEWS PRINT, WOBURN, MASS
1912

Report of Commissioner of Water and Water Supply

December 31, 1911.

To the Board of Public Works:

I herewith submit my annual report as Water Commissioner for the year 1911. During the year the cement lined pipes in various streets as shown by the appended report of the Superintendent have been replaced by cast iron pipe and I would urge the replacing of others recommended by him as rapidly as possible as it is evident from the reduction in consumption this year, as compared with last year, was due greatly to the replacement of these old and leaky cement mains.

The Platt pump at the Pumping Station has been in continuous operation during the year except from May 29th to June 6th at which time it was necessary to shut the engine down to make it ready for the official test. At this time several changes in the piping were necessary to make it conform strictly to the conditions called for by the contract, and after the test had been made, this piping all had to be replaced in its original working position. The official test was made on June 3rd and was of twelve hours' duration, details of which are contained in the report of our Engineer; Mr. F. A. Barbour, hereto appended. During the time this work was being done it was possible to keep the City supplied with water with the old pumps by keeping them in operation twenty-four hours daily, as at that time there was a good supply of water in the old wells.

There has been quite a substantial decrease in our water consumption during the past year. The average daily consumption being 1,856,274 gallons this year as against 2,130,108 gallons last year. This falling off is probably due to the replacing of many of the old cement lined mains with new cast iron pipe and to the fact that the manufacturing plants of the city have been using but little water.

The water in our pumping wells have been at a higher level as the draft on them has been lighter and the general conditions better. The driven wells, or Auxiliary Supply, at the westerly side of the pond have been in use constantly and have yielded a substantial supply.

The need of an auxilairy pump is very urgent as the greater part of the time there is not a sufficient quantity of water in the wells to which the old pumps are connected to supply the city and if the Platt pump should become disabled during even a moderately dry period, or when the consumption of water is large, it would be absolutely necessary to pump a large percentage of pond water. The only way of overcoming this is by placing a pump of sufficient capacity at the lower level as recommended in my report of last year. It is evident that many of our citizens do not realize the changed conditions at our pumping plant. In the early days of the Works, and for several years after, our old wells were considered almost inexhaustible, the consumption of water being small at that time. In 1892 it was but 802,076 gallons per day. Consequently the water in the ground was not lowered to any great extent. Since that time there has been a constant increase in the consumption of water until in 1910 it reached 2,130,108 gallons average daily consumption and on many days during the season it is over 3,000,000 gallons. Pumping at this rate lowers the water in the ground to six and seven feet below the bottom of the old wells.

While it was encouraging during the present year to note the decrease in consumption, there is no doubt that there still exists an extravagant consumption or waste in our system, and I think the only means of ever overcoming this is by the installation of meters on our services and I recommend that all possible haste be taken in that direction, especially where the old mains are being renewed with cast iron pipe.

Respectfully submitted,
WILLIAM H. CONWAY,
Commissioner of Water and Water Supply.

Report of Engineer

Boston, June 19, 1911.

Board of Public Works, Woburn Mass.

Gentlemen:—I beg to submit the following report of test, made June 3rd, 1911, of the vertical cross-compound pumping engine installed by the Platt Iron Works Company, under contract, dated August 2nd, 1907.

DUTY TRIAL OF ENGINE.

Duration of trial	12 hours

DIMENSIONS.

Diameter of high pressure cyclinder	18 inches
Diameter of low pressure cyclinder	36 inches
Diameter of water plunger, lower end (Nominal)	19 3-4 inches
Diameter of water plunger, lower end, (Actual)	19.72—19.73 inches
Length of stroke (Nominal)	36 inches

TEMPERATURES.

Temperature of water pumped	68 degrees
Temperature of cold feed water	64 degrees
Temperature of feed water, supplied boiler	80 degrees

Steam pressure at boiler, by gage	130 lbs.
Steam pressure at engine, by gage,	127.6 lbs.
Steam pressure in receiver by gage	10.3 lbs.
Vacuum by gage	25.3 lbs.
Water pressure, by gage on force-main	
Average of 12 hours	89.21 lbs.
Average first 6 hours of test	89.58 lbs.
Average last 6 hours of test	88.83 lbs.
Distance of pressure gage to surface of water in well:	
Average of 12 hours	15.09 feet
Average first 6 hours of test	15.10 feet
Average last 6 hours of test	15.08 feet
Total lift:	
Average of 12 hours	221.16 feet
Average first 6 hours of test	222.03 feet
Average last 6 hours of test	220.28 feet

FEED WATER DATA.

Total, feed water supplied boilers	40,896 lbs.
Total weight separator compensation	371 lbs.
Total weight calorimeter waste	63 lbs.
Total weight of feed water, less separator and calorimeter wastes	40,462 lbs.
Total heat of steam at boiler pressure per lb.	1,192.8 B. T.U.
Heat of cold feed water above 32 degrees per lb.	32.4 B. T. U.
Heat necessary to raise cold feed water to boiler temperature	1,160.4 B. T. U.
Total heat necessary to raise 40,896 lbs. cold feed water to boiler temperature	47,455.718 B. T. U.
Total heat added to cold feed water, by jacket comdensation	648,112 B. T. U.
Ratio of heat added by jacket, comdensation to total heat required to raise cold feed water to boiler temperature	1.36 per cent.

Reduction made from feed water for heat of jacket condensation	558 lbs.
Feed water chargeable to engine—total asweighed less separator and calorimeter wastes, less correction for jacket returns, plus correction for 3-16 inch drip of water in boiler during test (79) lbs	39,983 lbs.
Feed water chargeable to engine on same basis during first 6 hours of test	20,525 lbs.
Feed water chargeable to engine on same basis during last 6 hours of test	19,458 lbs.

PRINCIPAL RESULTS.

Discharge of pump, by revolution counter (Rate per 24 hours):

Average of 12 hour run	5,214,215 gals.
Average of first 6 hours of test	5,206,981 gals.
Average of last 6 hours of test	5,221.449 gals.

Discharge of pump, by weir measurement. (Rate per 24 hours):

Average of 12 hours run	5,075,742 gals.
Average of first 6 hours of test	5,047,736 gals.
Average of last 6 hours of test	5,103,748 gals.

Percentage of slip:

Average of 12 hour run	2.66 per cent.

Duty (Foot pounds per 1000 lbs. steam):

Average of 12 hour run	116,900.00 ft. lbs.
Average of first 6 hours of test	113,700.00 ft. lbs.
Average of last 6 hrs. of test	120,100.00 ft. lbs.

The pumping engine is of the vertical cross-compound fly wheel type, with differential water ends—the plungers having nominal diameters of 13 7-8 and 19 3-4 inches.

All gages were tested by dead weight apparatus before and after the duty trial; the scales used in weighing the feed water had been recently certified by the proper officials; the depth of water on the weir was taken by two hook gages—the record of the gage, placed in a stilling box outside of the weir tank, being used in the calculation of discharge. Readings of all gages were taken at fifteen minutes intervals, except those on the weir, which were read at ten minute intervals.

A competent fireman furnished a very uniform steam pressure, as near contract requirements as could be maintained; the percentage of moisture in the steam was within the specified limits; ample water was obtained from Horn Pond—the City being supplied from the reservoir; and the discharge of the pump, as recorded by the weir, can not be reasonably questioned.

The mechanical operation of the engine was in every way satisfactory, and the vibration was notably less than in the average engine of this type—a condition due to the low suction lift and freedom from air, and indicating the necessity of a provision by the City of some means of separating the air from the water drawn from the well, at low stages.

In starting the test, those in charge of the engine neglected filling the air-chambers, with the result that during the first six hours the pump ran without the cushioning effect of these chambers—rendering it difficult to accurately read the pressure gages on the force mains, and making it probable that the readings, taken during this period, were somewhat higher than the true average pressure. At the same time, there is no doubt that during this period the engine was not developing as good economy as it was capable of showing; a fact indicated by a comparison of the results of the first and last six hours of the duty trial.

The average duty obtained in the 12 hour run is 116,900,000 foot-pounds per 1000 pounds of steam, but the indications of the latter half of the trial, suggest that the engine can develop a duty of 120,000,000 ft. lbs.

It should be here stated that in estimating the steam chargeable to the engine, an allowance has been made for the heat returned to the boiler from the jackets. Ordinarily, and under the general specifications of this contract, such an allowance would not be made, and the engine would be charged with all steam used, without credit for heat returned to the boiler. A provision inserted in the detailed specifications stipulates that the contractor shall have the privilege of returning the jacket drips to the boiler. As this could be of no advantage to the contractor, and results in a saving to the city, this provision has been interpreted to allow a credit to the contractor for the heat returned by the apparatus applied for this purpose in-so-far as this return results in a reduction of a coal consumption. The Platt Iron Works guaranteed a duty of 138,000,000 ft. lbs. per 1000 lbs. of steam, and the contract stipulates, that if the engine should fail to meet the duty the contract price shall be reduced by an amount equal to the capitalized value, at six per cent. of the yearly cost of the excess coal, figured at $5.00 per ton, necessitated by the reduced economy of the engine, when pumping daily 1,250,000 gallons against 220 ft. ahead. In estimating the coal required, the conventional evaporation of 10 lbs. of water per pound of coal, has been used.

The followimg statement shows the deduction to be made from the contract price in accordance with the foregoing provision:

Coal necessary per year to pump 1,250,000 gals. per day against 220 ft. head, if guaranteed duty of 138,000,000 ft. lbs. per 1,000 lbs. of steam had been developed, 606,250 lbs.

Coal necessary per year to do same work with duty of 116,900,000 ft. lbs. as obtained by test, 715,676 lbs.

Excess coal per year necessitated by reduced economy, 109,426 lbs. or 54.71 tons.

Excess yearly expense necessitated by reduced economy, 54.71/tons $5.00, $273.55.

Capitalized value of excess yearly cost at 6 percent. $4559.17.

Total amount to be paid for pumping engine—contract price less deduction for reduced economy, $23,915.83.

The contract further stipulates that if the duty developed in the test does not reach 90 per cent. of that guaranteed, or 124,200,000 ft. lbs. the acceptance of the engine shall be optional with the city. There can be no question, however, that, with the loss in economy made good by the reduced price, it is to the advantage of the City to accept the engine. Further, it is to be noted, that, with the new boiler, capable of carrying 150 lbs. steam pressure—there is a possibliity of developing higher efficiency than that obtained during the test by raising the steam pressure on the engine above that furnished under the contract conditions.

Respectfully submitted.

F. A BARBOUR.

Report of the Superintendent of the Water Department for the Year 1911

Woburn, Mass., December 31, 1911.

To the Commissioner of Water and Water Supply:

Sir:— I have the honor to submit the following report on the condition of the work and operation of the department for the year ending December 31, 1911.

We commenced the relaying of our main pipe on April 10, 1911. This work was in progress until the appropriation was expended October 30, 1911.

The weather heing very favorable, considerable work was done during the past year, which will be shown by the following table stating length and size of pipe laid, and the size of pipe replaced.

The following streets were relaid:

Streets	Length laid	Size	Size of pipe replaced
Bryant	700 feet	6 inch	4 inch cement
Carter	705 feet	6 inch	4 inch cement
Garfield Ave.	1,795 feet	6 inch	4, 1, 1-2 and 3-4 inch
High	1,848 feet	6 inch	4 inch
Auburn	559 feet	6 inch	4 inch
Fairmount Ext.	155 feet	6 inch	4 inch
Walnut	700 feet	6 inch	4 inch
Everett	851 feet	6 inch	4 inch
Union	1,135 feet	6 inch	4 inch
Second	292 feet	6 inch	4 inch
Broad	1,737 feet	6 inch	4, 1 1-2 and 1 inch
Ash	745 ft	6 inch	4 inch
Buck	389 feet	6 inch	4 inch

Park	1,177 feet	6 inch	4 inch and 1 inch
Centre	872 feet	6 inch	4 inch
Church	1,068 feet	6 inch	4 inch
Charles	652 feet	6 inch	4 inch
Buckman	1,260 feet	6 inch	6 inch
Buckman Ct.	620 feet	6 inch	6 inch
Arlington Rd. from Buckman St. to Lake Ave.	346 feet	6 inch	6 inch cement
Sheridan	485 feet	6 inch	2 inch iron
Federal	450 feet	6 inch	2 1-2 inch cement
Frances	648 feet	6 inch	1 1-2 inch iron
Marion Ave	150 feet	6 inch	0

In addition to the above mentioned work, we laid 746 feet of 6 inch cast iron pipe to Clark's shop on Chester Avenue, for fire service.

On Rock Street we laid 723 feet of 2 inch pipe, which is a benefit to two families, who up to this time had no water. On Allen Street, we replaced a 3-4 inch temporary main, with 469 feet of 2 inch pipe, which gives ample supply to residents on this street. On Newbury Street, we laid 337 feet of 2 inch pipe to new house lots laid out there. On Burlington Street, we laid 127 feet of 2 inch pipe, which allows four residents of Burlington, Mass. to connect to our supply and for irrigation purposes, which is all metered.

On Mt. Pleasant Court, we replaced a 1 1-2 inch temporary main with 195 feet of 2 inch pipe, which improves the supply in this locality. On Marion Avenue off Wyman Street, we made a 6 inch connection, and laid 150 feet of 6 inch cast iron pipe; work being discontinued on account of weather conditions. The replacing of 1 1-2 inch temporary main with 6 inch cast iron main of Frances street being a great improvement, as this locality has built up extensively in the past few years.

Two hydrants were placed on this street, which affords the residents better fire protection. The new 6 inch main laid on Broad Street was not connected to Montvale Avenue, until the past year. This eliminates a dead end, and places two extra hydrants on this line of pipe.

On Garfield Avenue, the main pipe was extended about five hundred feet which was laid with 1 inch and 3-4 inch iron pipe. On Fairmount Street, were replaced 155 feet of 4 inch with 6 inch cast iron pipe.

On the extension of Rock Street, off Houghton Street, we replaced a 3-4 inch service pipe with 605 feet of 2 inch pipe, adding another water-taker to this line of pipe.

Repairs on Mains.

We had eighty-nine breaks in our main pipe. Of these, forty-seven were on 4 inch, twenty-seven on 6 inch, two on eight inch, ten on 10 inch, one on 12 inch, and 2 were on 14 inch. Of the above, nine were caused by lightning, three closing of hydrants; eight by settling of pipe; sixty-seven by thin lining, and two from rust.

Services.

There were fifty-five new services laid. Repairs were necessary upon 374. Of these, twenty-one were renewed; twenty-three required cleaning out; one hundred and forty-two were shut off for repairs;and general repairs were made on one hundred and eighty-eight.

Service Boxes.

Number of new service boxes were one hundred and four. Eight excavated and reset; six required repairing; fifty were replaced with new ones; twenty- four raised to grade, and one hundred and eighty-three were lowered.

Gates.

In the relaying of the main pipe on Bryant, Carter and Garfield Avenue, were added four 6 inch gates to our system. It was also necessary to replace seven four-inch with seven 6-inch, on this line of pipe. On High Street, were added two 6 inch, and seven 4 inch were replaced with seven 6 inch. Also replaced 4 inch gate for blow-off. On Auburn street, were added two 6 inch. On Fairmount Street, added one 6 inch. On Walnut Street, replaced two 4 inch, with two 6 inch. On Chester Avenue, added one 6 inch, for Clark's shop. On Everett Street, replaced two 4 inch with two 6 inch. On Union Street, replaced two 4 inch with two 6 inch. On Second Street, replaced two 4 inch, with two 6 inch. On Broad Street, added two 6 inch, and replaced two 4 inch with two 6 inch. On Ash Street, added one 6 inch, and replaced one 4 inch with one 6 inch. On Park Street replaced two 4 inch, with two 6 inch, and added one 6 inch. On Centre Street, replaced two 4 inch, with two 6 inch. On Church Street, replaced two 4 inch with two 6 inch, and added one 6 inch. On Charles Street replaced two 4 inch, with two 6 inch. On Buckman Street, replaced three 6 inch with three 6 inch, and added one 5 inch. On Buck man Court, added one 6 inch. On Sheridan Street, added one 4 inch gate for a hydrant. On Federal Street replaced one 2 1-2 inch with one 6 inch, and added one 6 inch, and one 4 inch. On the corner of Waltham and Lexington Streets, added one 6 inch. On Main, corner of Frances Street, added one 6 inch. On Marion Avenue, off Wyman Street, added one 6 inch. There were eleven gate boxes replaced with new ones, nine were dug up, and reset; repairs were made on two gates, and three were dug up and packed.

Hydrants.

During the year there were thirteen added. Repairs were made on eight. Twenty-three were replaced with those of modern make, as recommended in my former reports. Fifteen Walker hydrants set in the first of this make installed on the works. They have been examined during the year, and are all in good working order.

Meters.

The total number of meters now in use, is one hundred and seven, sixteen being added the past year. Twenty-four were replaced, and twelve required minor repairs.

Street Watering Standpipes.

There are now twenty in use. The usual repairs have been made during the past year.

Pumping Station and Grounds.

The grounds have been kept in good order. I would recommend that the shores around the pond be kept clean.

Shops.

We are greatly in need of better quarters for a repair shop. The present one is too small, as the work of relaying requires more material on hand. The storehouse on Winn Street has been vacated, which leaves the repair shop in a crowded condition. I would recommend that immediate action be taken on this matter.

Reservoir.

I would suggest that the bottom and side walls be concreted. This work would require the blasting of the bottom, and the cutting off of a portion of the back.

Stables.

There are three horses now in use. I would advise the purchasing of a horse, to replace one which is too light for the work.

Recommendations.

Again I recommend that the ground wires of the New England Telephone Company and Edison Electric Light Company should be removed from our service pipes. These wires serve to conduct the lightning to the mains. The wires of the Edison Company are sometimes "charged" which helps to weaken the pipe, In the relaying of mains, I would advise that the pipe be laid as great a distance as possible fron the street railway track location.

We should have a systematic inspection of all premises supplied with water and the restriction of all preventable wastes. This would mean additional expense, but would greatly aid in cutting down the wasteful loss of water.

In closing, I desire to call your attention to the following list of streets where improvements are needed at once.

Streets	Size pipe now used	Size recom.
Nichols	4 inch	6 inch
Poole	4 inch	6 inch
Harrison Avenue	4 inch	6 inch
Morse	4 inch	6 inch
Lexington (6200 feet)	0 inch	6 inch
Thorn	1 inch	6 inch
Auburn (200 feet)	4 inch	6 inch
Montvale Avenue	10 inch	12 inch
Winn	6 inch	6 inch
Cambridge	6 inch	6 inch

Of the above, my reason for recommending Winn and Auburn Streets is for the purpose of eliminating dead ends which should not exist in our system. I recommend the laying of the Lexington Street main as a benefit to the system on that side of the city. At present, the water on Cambridge Street is dependent upon the Bedford Street main, and whenever a break occurs on Bedford Street beyond South Bedford Street, this whole section has to be shut off. When repairs are necessary, it takes two men one-half day to notify water takers, that the water will be shut off, and in the spring and summer when the market gardeners are busy getting out small plants, the delay is liable to cause them considerable loss, besides depriving them for the time being, of fire protection. By putting in this main, there would be a good circulation of water, and additional supply for fire purposes.

Respectfully submitted,
ROBERT T. SPENCER,
Superintendent.

Report of Water Registrar for the Year 1911

Woburn, Mass., January 1, 1912.

To the Commissioner of Water and Water Supply:

Sir:—I have th honor to submit the following report of the revenue and expenditures, the number of water takers, fixtures, abatements, etc., for the year ending December 31, 1911.

Revenue and Expenditures.

Auxiliary Supply.

Overdrawn January 1, 1911	$2,438 63

New Pump and Pumping Station Addition.

Balance January 1, 1911	$10,344 25
Expended	11,493 13
Overdrawn January 1, 1912 ...	$1,148 88

Relaying Mains.

Receipts.

Balance January 1, 1911	$ 677 51	
Appropriation	20,000 00	
Transfer from Maintenance Acc't.	5,000 00	
		$25,677 51

Expended.

Labor	$15,087 19	
Material	10,553 29	
		25,640 48
Balance January 1, 1912		$37 03

Rock Street.

Appropriation		$80000

Expended.

Extension from Bedford Street	$485 76	
Extension from Houghton Street	215 05	
		700 81
Balance January 1, 1912		$99 19

Service Coustruction

Receipts.

Labor and Material	$667 61	
Transfer from Maintenance Acc't.	1,325 12	
		$1,992 73

Expended.

Services		$1,992 73

Cost of Water Works for year ending December 31, 1910	651,338 92	
Construction for year less amount turned into City Treasury	1,325 12	
		$652,664 04

MAINTENANCE.

Revenue.

Water Rate Collections:			
1909 Account:			
Domestic Rates		$21 50	
Fines		50	
Meter Rates		7 64	
			$29 64
1910 Account:			
Domestic Rates		$433 67	
Fines		9 75	
Meter Rates		581 42	
			$1,024 84
1911 Account:			
Domestic Rates		43,720 63	
Fines		69 25	
Seals		18 00	
Meter Rates		10,992 47	
Fractional Rates		198 31	
		$54,998 66	
Abatements	$190 79		
Discounts	5,147 15		
		5,337 94	
			$49,660 72
Sundry receipts (repairs, etc)			524 82
Total Collections, 1911			$51,240 02

Expenditures.

Maintenance:		
Cast Iron Pipe	$671 34	
Expressing	62 49	

Miscellaneous	522 69	
Miscellaneous labor	2,145 78	
New Harnesses	107 00	
New Meters	417 20	
Repairs to drinking fountain	30 04	
Repairs to Gates	43 65	
Repairs to hydrants	328 69	
Repairs to meters and meter pits	313 12	
Repairs to services	1,676 98	
Repairs to standpipes	137 87	
Repairs to street mains	1,655 46	
Repairs to wagons	69 10	
Salary (superintendent)	1,200 00	
Sharpening tools	13 71	
Stable	553 58	
Supplies	687 14	
Telephones	69 10	
		$10,704 94
Pumping Station:		
Changing piping for pump test	$211 42	
Care of grounds	319 00	
Expressing	5 30	
Fuel	3,045 88	
Insurance on boilers	75 00	
Lighting	21 50	
Miscellaneous	117 46	
Oil, waste and packing	396 15	
Piping for new boiler	114 33	
Pit for air separator	269 42	
Rental of emergency pump	182 50	
Repairing, plumbing engineer's house	57 90	
Repairs to boilers	62 26	
Repairs to pumps	41 72	
Salaries	3,543 71	

Supplies	155 88	
Telephone	24 05	
		8,643 48
Office:		
Salaries	$1,128 50	
Supplies	24 16	
		$1,152 66
Total expenditures, 1911		$20,501 08
Interest on water debt		3,540 00
Transfer to Relaying Mains Account		5,000 00
Transfer to Service Construction Account		1,325 12
Transfer to Sinking fund		20,873 82
		$51,240 02

RECEIPTS AND EXPENSES OF WATER WORKS FROM 1873 TO 1911 INCLUSIVE.

Year	No. S'rvic's	Receipts.	Expenditures			Surplus
			Maintenance	Interest	Total	
1872	......	....	....	6,165,76	6,165.76	‡6,175.76
1873	498	4,600.00	4,976.99	11,424.37	16,401.36	‡11,801.36
1874	734	16,755.30	9,457.28	20,329.50	29,786.79	‡13,041.49
1875	835	17,117.25	7,166.44	24,500.00	31,666.34	‡14,549.29
1876	992	19,886.96	8,603.84	24,500.00	33,103.84	‡13.216.98
1877	1,084	22,508.03	6,848.84	25,108.59	31,957.43	‡9,449.40
1878	1,208	23,975.08	7,393.30	25,125.00	32,518.30	‡8,543.22
1879	1,290	24,060.29	7,527.40	25,798.60	33,326.00	‡8,165.71
1880	1,361	25,793.61	10,336.61	26,441.00	37,777.61	‡10,984.00
1881	1,413	27,608.62	8,291.00	26,741.00	35,032.00	‡7,423.38
1882	1,487	27,447.84	9,877.59	26,041.00	36,918.59	‡9,470.75
1883	1,559	29,925.52	9,276.27	27,041.00	36,317.27	‡6,391.75
1884	1,627	30,010.77	7,691.76	27,041.00	34 732.76	‡4,721.99
1885	1,730	30,999.51	8,974.37	27,041.00	36,016.37	‡5,015.86
1886	1,844	32,654.27	10,292.99	27,397.13	37,690.12	‡5,085.85
1887	1,966	34,266.65	†13,326.90	27,073.50	40,400.40	‡6,133,75
1888	2,061	34,002.02	10,697.99	16,982.50	27,680.40	6,321.53
1889	2,154	36,534.03	11,134.84	26,035.56	37,170.49	‡646.37
1890	2,233	37,944.36	12,351.11	25,306.75	37,657.86	336.50
1891	2,302	37,756.57	13,049.45	24,577.75	37,627.20	129.37
1892	2,369	37,405.88	11,033.61	24,483.75	35,517.36	2,888.52
1893	2,464	41,106.00	15,980.64	17,692.58	33,673.22	7,432.78
1894	2,559	42,528.48	12,629.09	12,985.75	25,614.84	17,913.64
1895	2,628	44,828.39	13,241.98	11,271.75	24,513.73	20,313.66
1896	2,709	45,750.29	20,671.20	10,070.00	30,741.20	15,009.09
1897	2,773	47,634.56	19,407.23	8,936.00	28,343.23	19,291.33
1898	2,821	48,013.24	11,164.80	7,812.00	18,976.80	29,036.44
1899	2,869	48,096.26	10,748.75	6,626.08	18,374.75	30,721.41
1900	2,891	§44,201.44	13,450.68	5,725.38	19,176.06	25,025.38
1901	2,925	42,814.87	11,627.99	4,774.00	26,402 09	26,412.88
1902	2,962	42,857.58	13,251.55	3,676.00	16,927.55	25.930.03
1903	2,996	47,616 21	13,995.10	2,660.00	16 655.10	30,961.11
1904	3,021	* 46,742.19	16,916.60	1,652.00	18,568.50	28,173.59
1905	3,057	* 45,921.42	16,507.14	608.00	17,115.14	28,806.28
1906	3,111	* 47,619.72	16,661.32	64.00	16,725.32	30,894.40
1907	3,151	* 48,115.45	19,265.04	410.00	19,675.04	28,440.41
1908	3,188	* 51,134 04	25,232.27	508.10	25,740.47	25,393.57
1909	3,222	* 49,928.11	20,607.56	2,780.00	23,387.56	26,540.55
1910	3,250	* 51,514.62	21,914.14	3,010 00	24 924.14	26,590.48
1911	3,314	* 51,240.02	20,501.08	3,540.00	24,041.08	27,198.94
		1,439,955.45	502,082.85	600,956.32	1103,039.17	481,917.52

¶ Ten months.
† In this amount is included $1,000 transferred to construction account.
‡ Deficiency.
§ Appropriation for hydrant service reduced from 5,050 to 1,730.
‖ No appropriation for hydrant service.
* Water rates on Schools amounting to $537. 00 nor paid.

Statement showing pumpage of water since the plant was established in 1873. Also, consumption per capita for domestic and other purposes.

Year	WATER PUMPED.			CONSUMPTION PER CAPITA.			
				Annually.		Daily.	
	Domestic Purposes Gallons	Metered Water Gallons	Total Gallons	Domestic Purposes Gallons.	For all Purposes Gallons.	Domestic Purposes Gallons.	For all Purposes. Gallons
†1873-74..	99,522,564	....	99,522 564	*10 625 94	*10,625.94	70.47	70.47
1874-75..	228,114,068	13,946,060	242,060,128	23,841.35	25,298.92	65.81	69.31
1875-76..	253,070,098	13 573,566	266,643,664	25,718.55	27,026,78	70.46	74.04
1876-77..	225,350,577	18,775,415	244 125,992	22,285.46	24,142.20	61.05	66.14
1877-78..	162,523,918	24 843,325	187,367,243	15 649.94	18,070.90	42.87	49.51
1878-79..	262 212,585	30,414,959	237,627,544	19,535 80	22,295.69	53.52	61.08
1879-80..	226,167,598	41,671,685	267,839,283	20,691.39	34,502.72	56.68	67.13
1880-81..	239,085,793	30,460,765	269,546 558	21,550.90	24,296.60	59.04	66.56
1881-82..	250,489,800	31,505,186	281,994,986	22,249 93	24,988 47	60.96	68 46
1882-83..	269,660,902	31,566,923	301,227,825	23 609 20	26,372 59	64 68	72.25
1883-84..	214,940,593	37,978,384	252 918,977	18,551.75	21 829 70	50 82	59 80
1884-85..	187,874,878	43 341,199	231,216,977	15,989.55	19,667 96	43 80	53.91
1885-86..	218,303,505	33 042,819	251,346,324	18,043.10	20,774 14	49 43	56.91
1886-87..	312,407,520	22,012,063	344,419,580	25,094.98	26,863.16	68.75	73.59
1887-88..	285,924,528	38,363,477	324,288,000	22,967.67	26,049.32	61.28	71.36
†1888	193,639,657	41,854,103	235,193,760	18,155.13	22,079.26	49.74	60.49
1889	219,416,786	36,125,854	253,542,590	16,686.95	19,282 27	45.71	52.82
1890	251,052,891	42,752,509	293,805,400	18,597.88	21,764 97	50.95	59.63
1891	241,450,716	39,370,734	280,821,450	17,709.45	20,596.40	48.51	56.42
1892	248,856,570	43,719,280	292,575,850	18,072.37	21,247 33	49.51	58.21
1893	284,481,937	53,434 313	337,916,250	20,457.49	24,300 03	56.04	66.57
1894	313,450,904	57,566,396	361,017,300	22,322.38	25,709.82	61.15	70.43
1895	317,570,332	67,951,868	385,522,200	22,398.81	27,191.57	61 36	74.49
1896	324,880,999	50,586,401	375,467,400	22,786 01	26,333.80	62.45	72.14
1897	309,634,781	57,696,169	367,330,950	21,595.43	25,619.39	59.16	70.19
1898	314,896,516	48,127,334	363,023,850	21,839 60	25,176.76	59.83	68.97
1899	358,980,560	46,048,540	405,029,100	24,757.28	27,933 04	67.83	76.53
1900	374,863,730	42,572,170	417,435,900	26,298 84	29,285 52	72.05	80.23
1901	380,420,649	46 217,451	426,638,100	26,602.84	29,834 83	72.88	81.74
1902	403,426,680	41,255,670	444,682,350	28,310.64	31,205.78	77.56	85.49
1903	433,632,792	69,364,458	502,997,250	30,537 52	35,422.34	83 66	97.04
1904	453,058,373	67,226,077	520,284,450	31,793 57	36,511.18	87.10	100.03
1905	480,566,720	63,240,630	543,807,350	33,372.61	37,764.46	91.42	103.46
1906	492,138,200	60,243,700	552,381,900	34,176.26	38,359 85	93.63	105.09
1907	535,950,900	77,840,250	613,791,150	37,218.31	42,624.38	101.96	116.77
1908	523,207,190	81,287,180	604,494,370	36,333.83	41,978.77	99.24	114,69
†1909	580,831,290	79,573,950	660,405,240	40,335,50	45,861.47	110.50	125.64
§1910	680,602,921	98,386,635	778,989,556	44,483 19	50,914.35	121.87	139.22
1911** ..	593,775,936	83,764,350	677,540,286	38,808.88	44,283.67	106.32	121.32

§ 1½ per cent allowance for slip.

† Five months. ‡ Ten months. * Five months.

** 1½ per cent allowance for slip of new pump. 10 per cent allowance for old pumps.

NUMBER OF FIXTURES

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Totals Jan 1 1912	Totals Jan. 1. 1911
Faucets.........	1,178	1,174	1,205	1,564	487	815	323	6,746	6,557
Bath Tubs	175	169	162	195	70	151	31	953	890
Water Closets ...	548	467	490	688	118	171	58	2,540	2,438
Hose Attachm'ts	92	116	133	132	37	94	35	639	639
	1,993	1,926	1,990	2,579	712	1,231	447	10,878	10,054

STATEMENT OF INCOME FROM WATER RATES

	1907	1908	1909	1910	1911
Domestic Service	$40,933 70	$42,746 13	$42,568 19	$44,516 95	$44,471 61
Meter Service ...	10,454 94	10,046 42	11,359 51	11,732 62	11,581 53
Totals	$51,388 64	$52,792 55	$53,927 70	$56,249 57	$56,053 14
Abatements and Discount......	4,675 06	4,899 49	5,140 41	5,255 65	5,337 94
Totals	$46,713 58	$47,893 06	$48,787 29	$50,993 92	$50,715 22

Uncollected Water Rates.

Domestic Rates, 1907	$ 24 00
Domestic Rates, 1908	122 50
Domestic Rates, 1909	195 75
Domestic Rates, 1910	236 00
Domestic Rates, 1910	1,137 00
Meter Rates	511 02
	$2,226 27

WATER TAKERS

Classification	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	TOTALS	
								Jan. 1 1912	Jan. 1 1911
Almshouse	..	..	..	1	..	..	..	1	1
Armory	..	..	..	1	..	..	..	1	1
Automatic Sprinklers	..	5	1	1	..	1	..	8	7
Bakehouses	1	..	1	3	..	..	..	4	4
Banks	1	..	1	1	..	..	..	3	3
Car Stations	..	..	1	..	..	1	..	2	2
Cemeteries	..	..	..	1	15	..	..	16	16
Churches	2	..	2	3	2	2	..	11	11
City Hall	1	..	..	..	..	..	..	1	1
Contagious Hospital	..	..	..	1	..	..	..	1	1
Court House	1	..	..	..	..	..	..	1	1
Drinking Fountains	1	2	2	..	2	2	2	11	11
Dwellings	438	501	491	499	249	423	209	2810	2,770
Electric Light Station		..	..	..	..	..	..	1	1
Elevator	..	..	1	..	..	..	..	1	1
Engine and Hose Houses	..	..	2	..	1	2	1	7	7
Families	608	710	668	691	296	484	358	3815	3,777
Federal Building	..	..	1	..	..	..	..		
Foundries	..	2	..	..	1	..	..	3	3
Gas Works	..	1	..	..	..	..	..	1	1
Greenhouses	1	4	..	1	9	11	14	40	39
Halls, Clubs, etc.	5	1	10	14	1	1	..	32	32
Hose and Fountains	91	115	132	130	36	94	32	630	630
Hospitals	1	..	..	..	..	..	..	1	1
Hotels	1	1	1	..	..	..	..	3	3
Hydrants	49	63	51	65	45	81	36	390	377
Irrigation	2	..	6	1	5	7	19	40	34
Laundries	1	..	1	3	..	..	..	5	5
Manufactories	3	19	4	5	2	13	4	50	49
Motors	2	..	2	4	..	..	..	8	8
Police Stations	1	..	..	..	1	..	..	2	2
Printing Offices	..	..	2	1	..	..	..	3	3
Private Hydrants	..	..	..	..	1	3	..	4	4
Public Library	..	..	1	..	..	1	..	2	2
Public Park	1	..	1	..	..	1	..	2	3
Railway Stations	1	2	..	1	1	2	..	7	7
Sewer Connections	15	9	10	7	..	..	..	41	40
School Houses	5	1	2	3	5	2	2	20	20
Stables	50	75	50	24	58	44	31	332	332
Stores, Shops and Offices	24	42	58	190	11	14	3	342	340
Stone Crusher	..	..	1	..	..	..	..	1	1
Standpipes	4	3	2	9	..	1	1	20	20

STATEMENT OF EXPENSES BY MONTHS.

MONTHS.	MAINTENANCE.		PUMPING STATION		OFFICE.		TOTALS.	
	Pay Roll	Supplies	Pay Rolls	Supplies	Pay Rolls	Supplies	1911	1910
January	$582.41	$407 10	$334.96	$362 48	$105.75	......	$1,792.70	$2,423.56
February	471.02	86.36	241.54	202.86	84.60	1 60	1,087 98	1,630.95
March	633.30	319.21	297.82	367.79	113.25	......	1,731.37	1,347.67
April	378.43	210.56	250.54	270.18	84.60	......	1,194.31	1,549.14
May	509.13	428.56	318.00	401.65	84 60	2.16	1,744.10	1,467.85
June	830.16	156 12	446 31	553.85	105.75	......	2,092.49	1,996.88
July	718.84	497.62	389.70	658.18	102 60	......	2,366 34	1,607.91
August	698. 8	483.56	408.00	438.91	105.75	......	2,135.00	1 622.28
September	481.41	903.10	312.00	75.14	84.60	3 00	1,859.25	1,239 12
October	439 24	210.27	360.24	203.71	87.60	11.75	1,312.84	1,330.13
November	430.47	285.14	329.39	836 13	84.60	......	1,965 73	3,629.69
December	389.49	154.96	315.28	268.79	81.80	5.65	1,218.97	2,068 96
	$6,562.98	$4,141.96	$4,003.78	$4,639.70	$1,128.50	$24.16	$20,501 08	$21,914.14

The following is a statement of meters in use together with those on hand:

MAKE	½ in.	⅝ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	4 in.	Total
Crown	.....	.....	3	8	......	1	6	.....	18
Empire	.....	.....	1	1	......	1	.....	.....	3
Gem	.....	.....	......	......	......	......	......	2	2
Hersey	.....	.....	5	7	1	......	5	1	19
Indicator	.....	.....	......	......	......	......	1	.....	1
King	.....	2	......	15	......	......	......	.....	17
Lambert	.....	3	......	4	......	......	8	.....	15
Nash	.....	.....	......	1	......	......	......	.....	1
Neptune	.....	.....	15	......	......	......	3	.....	18
Thomson	.....	.....	2	2	......	1	1	.....	6
Union	2	.....	3	13	......	4	19	2	43
Worthington	.....	.....	......	7	......	......	4	.....	11
Total	2	5	29	58	1	7	47	5	154

Water Service.

Whole number put in to December 31, 1910	3,260
Number added in 1911	54
Total	3,314
Total number abandoned	69
Vacant service	56
Faucets locked	132
Faucets unlocked	93

COAL CONSUMPTION AND DUTY OF PUMPING ENGINES

1911	Number of Hours Pumping	Pounds of Coal used Firing and Banking	Pounds of Coal used Pumping	Gallons of Water Pumped	Daily Average Consumption in Gallons	Gallons Pumped per Pound of Coal	Average Lift in Feet	Average Height of Water in Reservoir, Feet	Average Height Water in Pond above High Water Mark in In.
January...	287½	15,500	118,200	55,881,880	1,802,738	417	227.7	16.9	3.5
February..	253½	14,400	109,600	52,218,504	1,8[illegible]4,94[illegible]	421	222.7	16.9	2.0
March	272¾	16,100	113,000	53,571,850	1,728,124	414	221.2	16.9	26.3
April......	255¾	16,000	103,300	52,342,368	1,744,745	438	221.2	16.9	26.8
May	333	16,000	132,200	60,360,228	1,947,104	406	221.2	16.9	28.5
June.......	322	13,000	134,500	53,804,496	1,793,483	364	221.2	16.2	28
July	369½	16,500	140,100	75,776,700	2,444,409	483	222.2	16	20
August....	286½	15,500	112,600	61,140,138	1,972,262	477	221.7	16	20
September	220	15,800	101,900	52,292,012	1,743,067	444	221.2	16	22.5
October ...	251¾	15,500	105,400	53,151,736	1,714,572	439	221.7	16	28
November.	265½	15,400	107,200	54,547,322	1,818,244	444	221.2	15.9	28.4
December .	292	19,800	131,700	52,450,052	1,691,937	346	221.2	16.3	28.4
Total....	3409¾	189,500	1,409,700	677,540,285	18,562,747	4236	222	16.3	22.7

During the year 642,261,828 gallons were pumped by the Platt Engine and 35,278,45 gallons by the Worthington and Blake engines.

Gallons pumped, 1910 778,989,556
Gallons pumped, 1911 677,540,286
Coal consumed, 1910 ....1,043 10-20 tons
Coal consumed, 1911 ....799 12-20 tons

Ten percent. allowance has been made for slip of old pumps.

One and one-half per cent. allowance has been made for new pump.

SUMMARY OF STATISTICS.

For Year Ending 1911.

In form recommended by the New England Water Works Association.

WOBURN WATER WORKS.

City of Woburn, Middlesex County, State of Massachusetts.
Population by Census of 1910, 15,308.
Date of construction, 1872-73.
By whom owned, City of Woburn, Mass.
Source of supply, Filter Gallery and Tubular Wells, near Horn Pond.
Mode of supply, pumping direct and to reservoir.

Pumping.

1. Builders of pumping machinery, Platt Iron Works and Worthington & Blake.
2. Description of fuel used: (a) kind, bituminous coal; (b) brand of coal, Pocahontas; (c) average price of coal per gross ton, delivered, $4.35; (d) percentage of ash, 9; (e) wood, price per cord, none used.
3. Coal consumed for the year, 1,599,200 pounds.
4. (Pounds of wood consumed) divided by three equals equivalent amount of coal, none.

4a. Amount of other fuel used, none.

5. Total equivalent coal consumed for the year.
6. Total pumpage for the year, 677,540,286 gallons, with 1 1-2 per cent. allowance for slip of new pump, and 10 per cent. for slip of old pumps.

7. Average static head against which pump works, 219 feet.
8. Average dynamic head against which pumps work, 222 feet.
9. Number of gallons pumped per pound of equivalent coal (3), 423.6.
10. Duty equals gallons pumped (6) times 8.34 (lbs.) times 100 times dynamic head (8) divided by total fuel consumed (3). Equals 78,442,489.

Cost of pumping, figured on pumping station expenses, viz., $8,643.48.

11. Per million gallons, $12.75.
12. Per million gallons raised one foot (dynamic), $0.057.

Cost of pumping, figured on total maintenance, viz., $20,501.08.

13. Per million gallons pumped, $30.26.
14. Per million gallons raised one foot (dynamic), $0.136.

FINANCIAL.

Maintenance.

Receipts.

From Consumers:

A.	Water rates, fixture........	$43,691 61	
B.	Water rates, meter	11,581 53	
C.	Net receipts for water (A) plus (B)	$55,273 14	
D.	Miscellaneous (rent, repairs, sales, etc.)	524 82	
		$55,797 96	
D2.	Discounts and abatements	5,337 94	
E.	Total from consumers......		$50,460 02

From Public Funds:

F.	Hydrants		
G.	Fountains	$275 00	
H.	Street waterings	250 00	
I.	Public buildings	255 00	
J.	General appropriations		
	Total from Public Funds		780 00
K.	Gross receipts from all sources		$51,240 02

Expenditures.

AA.	Management and repairs	$20,501 08	
BB.	Interest on bonds	3,540 00	
CC.	Total maintenance for year		$24,041 08
DD.	Transfer to Relaying Mains Account		5,000 00
GG.	Transfer to Service Construction Account		1,325 12
HH.	Balance transferred to Sinking Fund		20,873 82
K.	Total		$51,240 02

Consumption.

1. Estimated total population at date, 15,308.
2. Estimated population on line of pipe, 15,200.
3. Estimated population supplied, 15,200.
4. Total consumption for the year, 677,540,286 gallons.
5. Passed through meters, 83,764,350 gallons.
6. Percentage of consumption metered, .123.
7. Average daily consumption, 1,856,274.7 gallons.
8. Gallons per day to each inhabitant, 121.32.

Distribution.

Mains.

1 Kind of pipe, cement and cast iron.

2 Sizes, from 4-inch to 14-inch.

3. Extended during the year——–—feet.

4. Discontinued—— —feet during the year.

5. Total now in use, 57.43 miles.

6. Cost of repairs per mile, $28.82.

7. Number of leaks, per mile, 1.46.

8. Length of pipes less than 4 inches diam., 5.81 miles.

9. Number of hydrants added during year (public and private.) 13

10. Number of hydrants (public and private) now in use, 397.

11. Number of stop gates added during the year, 21.

12. Number of stop gates now in use, 492.

13. Number of stop gates smaller than 4-inch, 58.

14. Number of blow-off gates, 17.

15. Range of pressure on mains at centre of city, 70 pounds to 75 pounds.

Services.

16. Kind of pipe,lead lined, cement lined and galvanized.

17. Sizes, 1-inch.

18. Number of service taps added during year, 54.

19. Number now in use, 3,314.

20. Average cost of service, $36.90

21. Number of meters added, 8.

22. Number now in use, 102.

23. Percentage of service metered, .03.

24. Percentage of receipts from metered water (B divided by K), .226.

25. Number of motors and elevators added.

26. Number now in use, 10.

Respectfully submitted,

REDMOND E. WALSH,
Water Registrar.

MASS. STATE BOARD OF HEALTH,
ENGINEERING DEPARTMENT.

1912

ANNUAL REPORT
OF THE
WATER DEPARTMENT
OF THE
CITY OF WOBURN

For the Year Ending December 31, 1912

THE JOURNAL PRINT, WOBURN
1913

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For the Year 1912

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REPORT OF COMMISSIONER OF WATER AND WATER SUPPLY

December 31, 1912.

To the Board of Public Works:
Woburn, Mass.

Gentlemen:

Herewith I submit my report as Water Commissioner for the year 1912.

The most important thing during the year was probably continuing the work of laying the cast iron pipe to take the place of the old cement line, all of which is shown in the Superintendent's report herewith. This work was begun fairly early and was ended before the frost had entered the ground. In connection with this work an index system for the employment of men was tried out, and I think with very satisfactory results. Of course, it was not perfect, but the idea, if the system if properly checked up, is a good one. With such a large amount of money as it takes to pay for this pipe each year, it seems only right and just that every man who is able to do this sort of work is given his proportionate share, and I think this can be done better by some such system as this than in any other way. I hope it will be continued.

During the summer it looked at one time as though the water in the pond would have to be used for drinking purpose, and for this reason a notice was inserted in the daily papers asking every one to be as careful as possible in the amount of water used. Bathing was also prohibited in the pond, and while I regretted to stop it, as it was the only place where bathing could be enjoyed, I thought under the circumstances it was absolutely necessary.

I would respectfully suggest that the shore around the pond be freed from the substance which grows at the edge, at least twice a year, and if I were to continue to have charge of the department, I should see that this were done.

The consumption of water this year shows an increase over last year, the daily consumption being 1,984,763 gallons, as against 1,856,274 gallons last year. This increased consumption is due largely to the increased amount of water used by the farmers and particularly those who own greenhouses, and of course, to some extent to our leaky mains.

Pumping Station

The most important thing here is the fact that the Platt pump, about which there has been so much controversy, is at last definitely settled, and the pump is ours.

On January 1st, Mr. Hugh O'Doherty, a second-class engineer, was added to the force at the pumping station to comply with the State Engineer's License Law, and also the eight-hour law. Previous to January 1st, Mr. Pollard was the only licensed engineer at the pumping station. A little later in the year, a controversy arose, which was started by one of the local unions, to the effect that the time spent by the fireman who slept at the station nights should be construed as hours of labor, and it was claimed that this was contrary to the eight-hour law. This meant that another man must be added to the force, or the station closed at night. Investigation showed that all the pumping stations in the neighboring towns closed when the day's pumping was completed, and we could, with the same degree of safety, close ours, which we did. However, a recording alarm gauge was installed in the engineer's house, which gives an alarm in case the water in the reservoir should reach a point below the normal. A telephone was also installed in the engineer's and fireman's houses, so that all the appliances to indicate and prevent dangerous conditions have been installed, which obviated the necessity of securing another man.